Nova Scotia
Department of
Agriculture and Marketing

Plant Industry

Horticultural Crops Project Results 1990

FORWARD

These Horticultural Crops Project Reports are primarily reports on research and demonstration projects conducted by Horticultural Crops personnel in the Plant Industry Branch, Nova Scotia Department of Agriculture and Marketing. Several projects were conducted jointly with Agriculture Canada personnel and several were primarily designed and managed by growers. We are pleased to be able to report on all of these projects and are confident that every horticultural producer will find reports here of particular interest.

I would like to thank our Agricultural Technicians, John Arnold, Kim Best, Leslie Blackburn, Arthur Haskins and Andrew King for their assistance on many of these projects, as well as our Agriculture Canada and grower co-operators. A number of summer student assistants have also given dedicated efforts to these projects.

A number of the projects reported here were assisted under the Canada/Nova Scotia Agri-Food Development Agreement. We appreciate that assistance and have also attempted to acknowledge it in the individual reports.

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92-05505/

INDEX

GREENHOUSE AND ORNAMENTALS

Greenhouse Lettuce — Tip Burn Investigation 1

Greenhouse Tomato Trials 1990 2

Greenhouse Cucumber Trials 1990 3

Preliminary Evaluation of Statice Cultivars 5

Potted Plants — Gerbera Cultivar Evaluation 6

Regional Bedding Plant Trials, Truro Sites 8

Regional Bedding Plant Trial, Kentville Site 15

Flowering Kale and Cabbage Schedule Trial 22

Flowering Kale and Cabbage 1990 23

Impatiens New Guinea Hybrid Spectra 25

Garden Mums for Mother's Day 26

Garden Mum Variety Evaluation 29

Graphical Tracking for Poinsettia Height Control 34

Turf Trials — Variety Evaluation 40

BERRY CROPS

Evaluation of Dayneutral Strawberries 42

Viticulture Leaf Cutter 45

TREE FRUITS

Evaluation of M9 EMLA and M26 EMLA Rootstock 47

Commercial Performance of Gloster 69 on Dwarfing Rootstock 51

Orchard Systems Trial 53

Yield Packout Acceptability Comparison for 11 Scab Resistant Cultivars 57

Apple Rootstock, Cultivars and Training Systems Evaluation 66

Apple Rootstock Evaluation Trial 67

Pear Rootstock Evaluation Trial 68

VEGETABLES

Eastern Canadian Dry Bean Co-op Test 69

Cultivar Project '90 71

Cabbage Trial 1990 72

APICULTURE

Blueberry Field Pollinator Counts — 1990 73

Honey Bee Queen Rearing and Stock Improvement 77

Mechanical Moving of Bee Hives 78

Computer Program for Beekeeper Registration, Beekeeping Industry Statistics 82

PEST MANAGEMENT

Weed Control Programs for New Apple Orchards 83

The Effect of Spring Herbicide Applications on Fall Germinated Perennial Weeds in Strawberries 86

Effect of Spring Herbicide Applications on Creeping Buttercup in Strawberries 89

The Effect of Fall Herbicide Applications on Sheep Sorrel in Strawberries 92

Weed Control With Glean (Chlorsulfuron) in Lowbush Blueberries 94

Tolerance of Lowbush Blueberries to Triazine Herbicides 96

Herbicide Screening in Snapbeans 97

Herbicide Screening in Peas 100

Evaluation of Fungicides for Control of Powdery Mildew
in Strawberry Nursery Stock, 1990 103

Evaluation of Fungicides for Control of Carrot Blight 104

Lowbush Blueberry Insect Survey, 1990 105

Report on the Strawberry IPM Program, 1990 108

Computer Program for More Efficient Development and Effective Presentation
of Orchard Management Plans Preliminary Report 113

Advantages and Disadvantages of Using Pyrethroids in Nova Scotia Apple Orchards 114

Pesticide Use and Levels of Insect and Scab Injury on Fruit in Nova Scotia
Apple Orchards 115

Effeect of Pesticide Applications on Abundance of European Red Mite
and Typhlodromus Pyri in Nova Scotian Apple Orchards 116

Field Crops Section Project Report Titles 117

GREENHOUSE LETTUCE — TIP BURN INVESTIGATION

Brian Toms, Horticulturist
and Arthur Haskins, Technician

Abstract

Preliminary work for an investigation into the prevalence of tip burn in lettuce cultivars grown in the N.F.T. hydroponic system was completed in 1990. Two cultivars were grown during the period August 7 to October 23, but no tip burn was recorded.

INTRODUCTION: Tip burn is an occasional but potentially severe problem of greenhouse lettuce grown in nutrient film growing systems. Work in Belgium has suggested that this problem can be avoided by manipulation of potassium/calcium (K/Ca) ratios during the growing period. This trial is intended to examine the effects of various K/Ca ratios on lettuce cultivars grown in Nova Scotia.

MATERIALS AND METHODS: Two separate nutrient flow hydroponic growing systems were set up using 10 cm gutters as the troughs and re-circulating sumps containing submersible pumps. The gutters were covered with black polyethylene through which lettuce seedlings were placed. Two nutrient solutions - one with a K/Ca ratio of 1:1 and the other with a K/Ca ratio of 2.3:1 were used. The pH of the solution was maintained between 5.6 and 6.0 and the conductivity between 1.8 mmhos and 2.5 mmhos. Two cultivars of butterhead lettuce were used and seeding took place at two-week intervals from August 7 to September 18. The young plants were placed into hydroponic system after 10 days and harvesting occurred 35 to 38 days after seeding.

RESULTS AND DISCUSSION: The system, as constructed, developed a number of nutrient solution leaks which led to poor nutrient control for the first crops. No tip burn was observed on any crops and the trial will be repeated during 1991 now that the operational problems have been resolved.

In the cultivar comparison, Titania proved to be larger and heavier than Ostinata.

GREENHOUSE TOMATO TRIALS 1990

Brian Toms, Horticulturist
Arthur Haskins, Technician

Abstract

The newly introduced fusarium crown root rot resistant cultivar Trend was compared with the established greenhouse tomato cultivars, namely Caruso and Capello. The trial was grown in a heated greenhouse using the nutrient flow (N.F.T.) hydroponic growing system.

INTRODUCTION: Fusarium crown and root rot has become a serious disease of greenhouse grown tomatoes and has recently been recorded in Nova Scotia. The introduction of the cultivar Trend which has genetic resistance to this disease could be of great importance to greenhouse producers. This trial was intended to compare the performance of this new variety to existing varieties grown in N.F.T. in Nova Scotia.

MATERIALS AND METHODS: Seed of these greenhouse tomato cultivars was sown on January 8, 1990. The seedlings were transplanted into soil-less compost in 10 cm pots on January 23, 1990 and placed in a N.F.T. hydroponic growing system on March 15, 1990. Temperatures were maintained at 18°C at night and 20°C day. First harvest took place in May 20th and the trial was terminated on August. 16th.

RESULTS AND DISCUSSION: Yield data indicated that Caruso tended to produce the heaviest crop with the best grade out for quality. Caruso was followed by Capello and then Trend. There was no difference in the fruit size of the three cultivars.

It was also noted during this trial that the cultivar Trend appears to have a thinner fruit skin and may be more prone to damage, especially during harvesting and when the calyx is not removed. The central "core" in the fruit of this variety is also quite large and tough. Modification of the growing regime may result in some improvement of these characteristics of the fruit.

CONCLUSION: The greenhouse tomato Trend shows promise as a commercially acceptable cultivar although some modifications to current growing regimes may be required to achieve the maximum yield and quality performance. The cultivar's resistance to fusarium crown and root rot disease will be important where this disease has been recorded.

Table 1: Greenhouse Tomato Yield and Quality

	Yield	Quality		Avg. Weight	
Cultivar	kg/m^2	% #1	% #2	% cull	gm/fruit
Caruso	15.94	75.1	20.6	4.2	226
Capello	15.42	72.9	21.4	5.7	225
Trend	14.47	66.1	25.9	8.0	226

GREENHOUSE CUCUMBER TRIALS 1990

Brian Toms, Horticulturist
Arthur Haskins, Technician

Abstract

Six cultivars of greenhouse cucumbers were grown as a spring crop in 1990 using different hydroponic growing systems. The nutrient film technique (N.F.T.) was compared with a recirculating system using perlite as a rooting medium. None of the cultivars proved superior to the industry standard (Corona) whilst the perlite growing systems gave some increase in fruit/m^2 over the N.F.T. system.

INTRODUCTION: The nutrient film technique of hydroponic growing is a re-circulating system with no losses to drainage. This results in a reduction of fertilizer used and no contamination of ground water. The system has been used successfully for many years for greenhouse tomato production but cucumbers grown in N.F.T. have not been as good. In an effort to increase the rooting area and oxygen available to the roots, cucumber plants were set out in a modified system using perlite as a rooting medium.

MATERIALS AND METHODS: Greenhouse cucumber seeds were sown on February 16 in a soilless compost in 10 cm pots. The plants were placed in the following growing systems in mid-March.

1. A standard nutrient flow technique trough where a thin layer of nutrient solution flows by gravity along the trough to the collection tank and is circulated from the tank to the top of the trough.
2. A modified system where containers of perlite were stood in the trough and the plants placed in these. The containers contined drainage holes and the plants were sub-irrigated with the recirculated nutrient solution. Each container in this treatment held 6 litres of perlite.
3. As treatment '2' but with larger containers holding 8 litres of perlite.

Growth in all systems was good and yields were recorded from April 20 to August 13. Pest control was achieved with the use of biological control agents and the trial was terminated in mid August.

RESULTS AND DISCUSSION: Yield and quality information for the comparison of growing systems is contained in Table 1. The 6 litre perlite per plant system gave the highest number of cucumbers per plant. However, fruit size was smaller and percentage of Grade 1 fruit was slightly lower in both of the perlite systems when compared to the standard N.F.T. treatment. The response of the three cultivars to the different growing systems was similar and a comparison of yields is presented in Table 2. Corona is grown by the majority of producers and remains the standard by which new cultivars are compared. In this trial, Aricia performed well although fruit size was a little smaller than Corona. Radja was disappointing both in number of fruit harvested and in the percentage of Grade I achieved.

An observation trial was also grown in the N.F.T. system using the outside rows in the greenhouse. Three cultivars were used and the sowing date, harvest date and date of termination were the same as for the main trial. Results of this observation are included in Table 3. The powdery mildew resistant cultivar Carmen was included in this trial as it would be very useful to have this resistance in cucumber crops grown with biological control programs. However, the yield from this cultivar was not as good as that from the other cultivars in the trial although the fruit quality was excellent.

CONCLUSION: Further studies into recirculating hydroponic growing systems are required in order to demonstrate the reliability of such systems and to maximize crop performance.

Table 1: Cucumber Yields and Grades with Nutrient System

			% Size Grades			
System	*Fruit/ m^2	Grade 1 %	% Small	% Medium	% Large	% E/Large
N.F.T.	56.3	93.1	12.4	45.9	29.2	5.5
Perlite 6L	62.5	90.7	15.1	46.0	25.1	4.5
Perlite 8L	57.6	91.6	14.2	47.4	25.4	4.6

* 1.3 plants/m^2

Table 2: Cucumber Yields and Grades

			% Size Grades			
Variety	*Fruit/ m^2	Grade 1 %	% Small	% Medium	% Large	% E/Large
Aricia	60.3	92.7	18.1	42.1	26.5	6.0
Corona	60.2	93.3	12.5	47.4	29.7	3.8
Radja	55.9	89.4	11.2	49.8	23.5	4.9

* 1.3 plants/m^2

Table 3: Cucumber Yields and Grades

			% Size Grades			
Variety	*Fruit/ m^2	Grade 1 %	% Small	% Medium	% Large	% E/Large
Mustang	64.3	92.9	20.1	48.7	21.6	2.5
CG32	63.6	90.2	19.3	49.0	20.1	1.7
Carmen**	59.0	93.0	10.0	43.2	33.9	5.9

* 1.3 plants/m^2

** Mildew tolerant

PRELIMINARY EVALUATION OF STATICE CULTIVARS

Brian Toms, Horticulturist
Arthur Haskins, Technician

Abstract

Six colour selections of Statice were grown in 1990 in an unheated greenhouse. Data was recorded for flower numbers and stem lengths.

INTRODUCTION: Interest in the production and use of dried flowers has increased in recent years. Statice is an important plant for this use and several producers have reported problems in obtaining satisfactory crops. This project was designed to investigate the possibility of growing this crop in unheated greenhouses after the bedding plant season.

MATERIALS AND METHODS: Seed of six different colour selections of the Statice cultivar Fortress was sown on March 25, 1990 and transplanted into bedding plant packs on April 12 using a soilless growing compost. The plants were moved to an unheated structure in early May and planted into 25 cm pots on June 10 (4 plants per pot). The pots were arranged as two replicates of four pots each. Water and fertilizer were given as required and records were taken of the number of flowers produced and the stem lengths of the harvested flowers.

RESULTS AND DISCUSSION: Harvesting took place on three occasions (July 31, August 16 and September 7) and the results showed a wide variation in the number of flowers produced. Stem length was also variable but all of the colour strains produced stems of acceptable length.

Table 1: Flower Number and Stem Length

	Stems/Pot	Average Stem Length
Fortune Yellow	19.9	41 cm
Fortune Rose	9.0	36 cm
Fortune White	8.3	39 cm
Fortune Purple	4.9	34 cm
Fortune Dark Blue	3.0	32 cm
Fortune Heavenly Blue	1.9	39 cm

Yellow clearly outyielded the other strains but also produced somewhat thinner stems. Production levels of purple and the blues was disappointing and further trials are planned to investigate other strains of Statice for productivity and for resistance to bud abortion which caused some loss of production.

POTTED PLANTS
GERBERA CULTIVAR EVALUATION

Brian Toms, Horticulturist
Arthur Haskins, Technician

Abstract

Seven cultivars of dwarf Gerbera were grown in 12.5 cm pots using two sowing dates - October 31 and November 30, 1989. Flowering took place in April and May 1990. All of the cultivars flowered over an extended period with the best producing flowers on 70% of the pots over the 4-week recording period. Flowers per plant varied with cultivars Pandora and Festival producing the largest number and Happipot and Cyclops the least.

INTRODUCTION: Dwarf gerberas have been grown for a number of years as flowering pot plants. However, flowering in one cultivar can take place over a prolonged period of time. Recently a number of new strains of dwarf gerbera have been introduced and the trial was intended to examine the flowering characteristics of seven cultivars.

MATERIALS AND METHODS: Seed of seven cultivars of dwarf gerbera were sown on October 31 and November 30, 1989. The seedlings were transplanted into 806 cell packs on November 15 and December 20 respectively. Final potting into 12 cm pots took place on January 15 and February 7, 1990. Twenty plants of each cultivar were grown, divided into two replicates of ten plants each. A soilless compost was used throughout the trial and nutrients were supplied by liquid fertilizer applied weekly. Flowering took place in April and May and records were taken of flowering time, numbers of flowers and buds present as well as the height and width of the potted plants.

RESULTS AND DISCUSSION: The results for plant size and number of buds and flowers produced are contained in the tables and show that whilst differences between the size of the plants were not great, Happipot, Chic and Nain tended to be tallest. The average number of flowers plus buds per plant showed Pandora and Festival to have the most flower potential and Happipot to have the least.

Records were also taken of flowering time and the number of plants to flower in a four-week period. All of the cultivars from the first sowing produced the maximum number of flowering plants in the period between April 2 and April 27. Results from the November sowing showed the cultivar Fstival to be one week earlier than the average whilst Nain and Happipot were one week later. The average flowering period was April 23 to May 18.

The percentage of plants of each cultivar to flower in the best 4-week period continues to be rather low as is shown in Table 2.

CONCLUSION: Variability in flowering time continues to be a major problem in producing potted gerbera although some progress has been made and cultivars such as Festival and Pandora represent an advance over the original introduction Happipot in both quantity of flowers produced and in the uniformity of flowering.

Table 1: Plant Size and Flower Number

1st Sowing — October 31 Average of 20 plants per cultivar

Cultivar	Chic	Pandora	Tempo	Festival	Nain	Happipot	Cyclops
Height (cm)	35	35	35	34	39	41	36
Width (cm)	33	28	30	30	34	34	29
# of flowers + buds	4.0	4.2	4.0	3.8	3.0	2.4	3.5

2nd Sowing - November 30 Average of 20 plants per cultivar

Cultivar	Chic	Pandora	Tempo	Festival	Nain	Happipot	Cyclops
Height (cm)	39	34	33	33	38	34	36
Width (cm)	33	33	34	31	35	31	32
# of flowers + buds	3.0	3.8	3.8	4.2	3.2	2.6	2.6

Table 2: Uniformity of Flowering

Flowering % in Best 4-Week Period

Cultivar	1st Sowing	2nd Sowing
Chic	70%	50%
Pandora	65%	65%
Tempo	65%	45%
Festival	70%	60%
Nain	55%	45%
Happipot	65%	35%
Cyclops	60%	60%

REGIONAL BEDDING PLANT TRIALS

Brian Toms, Horticulturist
Arthur Haskins, Technician

Abstract

Two hundred and fourteen (214) cultivars of popular bedding plants were evaluated during the 1990 growing season. Data was recorded for plant height, width and bloom size, as well as an overall rating for garden performance.

INTRODUCTION: The regional bedding plant trials involve six sites in Atlantic Canada. The object of the trials is to screen available cultivars of the selected species and to identify those most suited to the region, thus enabling both producers and consumers to obtain the best plant material available.

METHODS: The bedding plants were raised from seed and grown in a soilless compost in 806 paks or 10 cm pots (geraniums). Initial growth took place in the greenhouse and the trails were planted out in the trial beds during the first week of June and field evaluations took place on August 7 and 8.

RESULTS: All measurements are in centimeters and the cultivar rating is out of a total of 50 points awarded for flower quantity, disease resistance and plant trueness to type.

Seed sources are identified as follows: (B - Ball Superior Ltd.), (JVK - Jack Van Klavaren Ltd.), (P - W. H. Perron); (S - Stokes Seeds Ltd.), (RS - (Royal Sluis Inc.).

Results of the four trials are shown in Tables 1-4 inclusive, as follows:

Table 1	Regional Bedding Plant Trial
Table 2	Pansy Trial
Table 3	All America Selections
Table 4	Miscellaneous Bedding Plants

DISCUSSION: Regional Bedding Plant Trial (Table 1) The 1990 growing season was very wet in May and then hot and dry for the remainder of the summer. Species such as petunia, alyssum and dusty miller performed very well. Geraniums flowered well but growth was restricted. Salvia and marigold growth was good but flowering was effected by the high temperatures and humidities. Ageratum performance was disappointing.

Pansy Trials (Table 2) The pansy trial involved a series of synthetic hybrid cultivars which were compared with a standard variety (Universal Mixture). The Armando varieties are bred for larger flowers than the Corso series. The results showed that both series of synthetic hybrids would be acceptable as commercial cultivars.

All America Selections (Table 3) The All America Display Garden includes all the varieties selected for the past three years. Introductions for the 1990 growing year included a seed grown geranium, three vinca cultivars, two pansies and a gailardia with disappointing colour.

Miscellaneous Bedding Plants (Table 4) The miscellaneous variety trial included a selection of cultivars frm Royal Sluis. Of these, the lobelia "Rapid Blue" and the alyssum "Snow Crystals" were outstanding. Other noteworthy cultivars included begonia "Roxy White", celosia "Jessica Mix", alyssum "Maritima Mibnimum" and geranium "Satellite Orange/Salmon".

REGIONAL BEDDING PLANT TRIAL

Table 1: Field Evaluation (Truro)

CULTIVAR	(CM) PLANT HEIGHT	PLANT WIDTH	BLOOM SIZE	RATING	SOURCE
Marigold					
Moll Flanders	54	42	7.0	49.0	B
Little Nell	44	39	7.5	49.0	B
Instant Yellow	25	29	4.0	49.0	S
Viva	25	27	5.0	48.0	B
Disco Golden Yellow	30	28	5.5	48.0	B
Naughty Marietta	35	36	5.5	47.0	JVK
Burgundy Ripple	34	33	4.5	47.0	JVK
Cinnibar	42	38	5.5	47.0	JVK
Olé	25	33	6.0	47.0	B
Disco Marietta	24	26	5.0	46.0	B
Granada	24	29	5.0	45.0	S
Red Marietta	19	25	5.0	44.0	S
Mini Marietta	20	26	4.0	43.0	S
Disco Orange	26	25	5.0	43.0	B
Dainty Marietta	29	30	5.0	42.0	JVK
Disco Red	19	21	4.0	42.0	B
Disco Flame	15	20	5.0	37.0	B
Alyssum					
Snow Crystals	18	35		50.0	S
Wonderland White	17	35		49.5	P
Tiny Tim	16	28		49.5	B
Snowcloth Select	17	35		49.5	S
Easter Bonnet	17	35		49.0	JVK
Snowcloth Improved	23	35		49.0	P
Oriental Night	19	35		49.0	P
Navy Blue	23	35		49.0	S
Royal Carpet	16	35		49.0	S
Snowdrift	23	35		48.5	P
New Carpet of Snow	15	35		47.0	B
Carpet of Snow	15	32		47.0	S
Rosie O'Day	14	35		45.0	S
Midnight	14	28		44.0	JVK
Wonderland Rose	13	28		44.0	S

Table 1 cont'd

CULTIVAR	(CM) PLANT HEIGHT	PLANT WIDTH	BLOOM SIZE	RATING	SOURCE
Salvia					
Violet Flame	27	42		48.0	B
Scarlet Pimpernel	31	35		48.0	B
Little Tango	34	34		48.0	JVK
Scarlet Midget	37	40		48.0	JVK
Fireball	40	36		47.0	B
Scarlet King	44	36		48.0	P
Scarlet Signal	35	37		49.0	S
Sparkler	37	39		47.0	JVK
Red Pillar	40	40		47.0	B
St. John's Fire	37	38		47.0	P
Scarlet Queen	39	34		47.0	S
Inferno	23	28		41.0	B
Sky and Ice	37	36		49.0	S
Fire and Ice	34	28		45.0	S
Red Hot Sally	39	35		49.0	B
Cleopatra Purple	38	35		49.0	S
Cleopatra White	35	32		49.0	S
Cleopatra Salmon	37	32		47.0	S
Cleopatra Violet	41	27		49.0	S
White Fire	39	34		49.0	B
Blaze of Fire	51	45		46.0	B
Empire Light Salmon	38	34		49.0	B
Empire Dark Salmon	42	37		49.0	B
Empire Lilac	38	34		49.0	B
Empire White	37	34		48.0	B
Carabinieré Scarlet	35	36		48.0	B
Carabinieré Blue	40	39		48.0	B
Carabinieré Red	36	37		48.0	B
Carabinieré White	34	32		49.0	B
Carabinieré Orange	34	35		48.0	B
Ageratum					
Blue Mink	34	30	5.5	48.0	JVK
Dwarf Blue Bedder	25	35	4.0	47.0	S
Blue Danube	21	24	4.0	46.0	S
Bavaria	29	24	6.0	46.0	S
Blue Lagoon	21	26	3.5	44.0	S
Ocean Improved	17	20	4.0	43.0	S
Madison	27	25	4.0	43.0	S
Adriatic Improved	21	24	3.5	42.0	S
North Sea	18	17	4.0	42.0	JVK
Blue Blazer	39	35	3.0	38.5	B
Pacific Improved	19	23	4.0	37.0	S

Table 1 cont'd

CULTIVAR	(CM) PLANT HEIGHT	PLANT WIDTH	BLOOM SIZE	RATING	SOURCE
Petunia					
Pink Madness	32	35	7.0	49.0	B
White Madness	32	35	7.0	49.0	B
Sheer Madness	32	35	6.5	49.0	B
Sugar Madness	33	33	7.0	49.0	B
Pink Carpet	30	35	7.0	49.0	S
Polo Pink	37	35	7.0	49.0	S
Polo Velvet	44	35	7.0	48.0	S
Polo Salmon	29	35	5.5	48.0	S
Celebrity Hot Pink	32	35	7.5	48.0	S
Plum Purple	37	35	7.0	48.0	JVK
Rose Madness	31	35	7.0	48.0	B
Plum Madness	29	30	6.5	48.0	B
Red Madness	30	32	6.5	48.0	B
Burgundy Madness	34	35	7.5	48.0	B
Highlight Carmine	25	35	6.5	48.0	S
Highlight Blue	39	35	7.5	47.0	S
Highlight Coral	31	35	7.0	47.0	S
Coral Madness	29	28	6.0	47.0	B
Star Joy	32	35	5.0	47.0	JVK
Rose Carpet	29	35	6.5	47.0	S
Velvet Carpet	32	35	6.0	47.0	S
Polo Burgundy Star	29	35	4.5	47.0	S
Celebrity Blue	32	33	6.0	46.0	S
Polo White	43	35	6.5	46.0	S
Celebrity White	33	35	7.0	46.0	S
White Carpet	38	35	7.0	46.0	S
Plum Carpet	28	31	6.0	46.0	S
Red Carpet	32	35	6.0	46.0	S
Polo Deep Blue	32	30	6.0	46.0	S
Summer Madness	31	35	5.0	46.0	B
Plum Blue	32	31	5.0	45.0	JVK
Sky Joy	28	29	6.0	45.0	JVK
Celebrity Salmon	35	35	7.0	45.0	S
Celebrity Red	36	35	6.5	45.0	S
Polo Red	31	35	7.0	45.0	S
Polo Blue Star	33	31	4.5	43.0	S
Rose Parasol	23	28	5.0	43.0	P
Starlight Joy	33	28	6.0	43.0	JVK
Dusty Millar					
Silver Feather	25	28		50.0	JVK
Cirrus	25	29		50.0	B
Maritima Diamond	40	34		50.0	JVK
Silver Dust	28	28		50.0	S
Silver Lace	34	27		46.5	S

Table 1 cont'd

CULTIVAR	HEIGHT	WIDTH	BLOOM SIZE	RATING	SOURCE
Geranium					
Satellite Orange Salmon	35	37		48.0	S
Orbit Deep Salmon	30	32		46.0	B
Orbit Light Salmon	25	33		45.0	B
Bandit Salmon	34	33		45.0	B
Orbit Hot Pink	37	38		45.0	B
Bandit Red	32	32		44.0	B
Tiffany	39	36		44.0	B
Elite Scarlet	35	32		44.0	B
Pinto Red	25	28		44.0	B
Ringo Deep Red	34	36		43.0	S
Ringo Deep Scarlet	32	29		43.0	B
White Elite	25	27		43.0	B
Pink Elite	28	28		42.0	B
Multi-Bloom Bright Rose	31	28		42.0	B
Orbit Rose	32	29		42.0	B
Challenge White	26	29		42.0	S
Cherry Elite	26	37		42.0	B
Neon Rose	30	23		40.0	B
Multi-Bloom Lavender	27	23		40.0	B
Multi-Bloom Red	22	18		39.0	B
Multi-Bloom White	26	21		38.0	B
Multi-Bloom Salmon	22	21		37.0	B
Multi-Bloom with Eye	20	17		36.0	B
Multi-Bloom Scarlet	25	18		34.0	B
Multi-Bloom Pink	21	17		33.0	B

Table 2: Field Evaluation (Truro) PANSY CULTIVAR TRIAL

CULTIVAR	(CM) PLANT HEIGHT	PLANT WIDTH	BLOOM SIZE	RATING	SOURCE
Armando Blue/Eye	23	20	4.5	47.0	RS
Corso White/Eye	20	18	4.0	46.0	RS
Corso Pure White	23	20	4.0	46.0	RS
Corso Blue/Eye	20	19	4.0	45.0	RS
Armando Pure White	21	19	4.5	45.0	RS
Armando White/Eye	23	24	5.0	45.0	RS
Armando Yellow/Eye	18	17	4.5	44.0	RS
Corso Mix	21	18	4.0	44.0	RS
Corso Beaconsfield	22	21	4.0	44.0	RS
Corso Pure Yellow	20	20	4.0	43.0	RS
Armando Mix	19	16	4.0	43.0	RS
Universal Mix	21	19	4.0	43.0	RS
Armando Red/Eye	21	19	4.0	43.0	RS
Armando Orange	22	23	4.5	43.0	RS
Armando Red Wing	19	20	4.5	43.0	RS
Armando Violet Blue	22	21	5.0	43.0	RS
Corso Yellow/Eye	21	19	4.0	42.0	RS
Corso Red Wing	14	16	4.0	42.0	RS
Corso Orange	19	18	4.0	41.0	RS
Corso Violet Blue	16	17	3.5	41.0	RS
Corso Red Eye	19	21	4.0	41.0	RS
Armando Rose Pink	16	17	4.5	38.0	RS

Table 3: Field Evaluation (Truro) ALL AMERICA SELECTIONS

CULTIVAR	(CM) PLANT HEIGHT	PLANT WIDTH	YEAR OF INTRODUCTION	RATING
Coreopsis Early Sunrise	39	29	1989	49
Geranium Freckles	22	23	1991	44
Zinnia Scarlet Splendor	63	40	1990	47
Cosmos Ladybird Scarlet	36	30	1991	48
Achillea Summer Pastels	52	40	1990	45
Marigold Golden Gate	29	32	1989	46
Vinca Parasol	29	27	1991	48
Vinca Pretty in Rose	23	22	1991	49
Vinca Pretty in Pink	31	25	1991	49
Celosia Pink Castle	24	23	1990	47
Snapdragon Princess White/Eye	28	23	1987	45
Verbena Sandy White	17	20	1989	43
Verbena Novalis Deep Blue	21	28	1989	48
Pansy Jolly Joker	16	19	1990	41
Pansy Maxim Marina	15	19	1991	46
Pansy Padparadja	14	14	1991	43
Petunia Polo Burgundy Star	29	32	1990	47
Petunia Polo Salmon	32	27	1990	47
Petunia Ultra Crimson Star	30	32	1988	47
Petunia Purple Pirouette	30	29	1987	42
Dianthus Telstar Picotee	21	22	1989	48
Petunia Orchid Daddy	26	29	1989	47
Gallardia Red Plume	30	38	1991	47

Table 4: Field Evaluation (Truro) MISCELLANEOUS BEDDING PLANTS

CULTIVAR	(CM) PLANT HEIGHT	PLANT WIDTH	BLOOM SIZE	RATING	SOURCE
Marigold	19	26	4.5	48	RS
Dahlia Figaro White	31	30	5.5	44	RS
Dahlia Figaro Imp Mix	30	32	7.0	48	RS
Gazania Chasonette Mix	17	23	5.0	43	RS
Gazania Chasonette Orange	16	25	5.5	46	RS
Gazania Chasonette Yellow	14	20	5.0	42	RS
Begonia Roxy White	15	18	2.5	48	RS
Begonia Lucifer	17	19	3.0	47	RS
Begonia Roxy Rose Pink	14	20	3.0	47	RS
Begonia Coco Ducolor	15	17	2.5	47	RS
Begonia Roxy Scarlet	16	15	2.5	46	RS
Lobelia Rapid Blue	16	28	1.5	50	RS
Celosia Jessica Mix	10	15	8.0	49	RS
Celosia Chantel Mix	25	21	8.0	48	RS
Ageratum Ocean Imp	17	20	4.0	43	RS
Ageratum Blue Lagoon	21	26	3.5	44	RS
Ageratum Pacific	19	23	4.0	37	RS
Ageratum Atlantic	15	16	3.5	38	RS
Alyssum Maritima Mininum	15	29		49	RS
Alyssum Snow Crystals	18	35		50	RS
Salvia Cleopatra Violet	41	27		49	RS
Salvia Cleopatra Salmon	37	32		47	RS
Salvia Scarlet King	44	36		48	RS
Salvia Scarlet Queen	39	34		47	RS
Salvia Scarlet Signal	35	37		49	RS
Salvia Scarlet Pimpernel	31	35		48	RS
Salvia Scarlet Midget	37	40		48	RS
Geranium Satellite Orange Salmon	35	37		48	RS

REGIONAL BEDDING PLANT TRIAL

Bev MacPhail, Greenhouse Specialist
Kim Best, Technician

Abstract

The Kentville Research Station is one of the six Atlantic locations that evaluate new and established varieties of the most popular bedding plants for flowering period, amount of bloom, trueness to type and plant disease resistance. The 1990 trials included 25 varieties of salvia, 5 varieties of dusty miller, 12 varieties of ageratum, 17 varieties of marigolds, 37 varieties of petunias, 24 varieties of geraniums and 14 varieties of alyssum. The salvia, ageratum, petunia, geranium and alyssum were evaluated and rated. The bedding plants were labelled and in an accessible location for the general public and growers to view during the summer.

INTRODUCTION: The regional bedding plant trial evaluates bedding plants at six locations — Truro, Kentville, Cape Breton, Charlottetown, Fredericton and St. John's. The Atlantic Advisory Committee of Greenhouse and Ornamentals coordinates the selection of the most popular bedding plants which are grown at the six sites. The trials are evaluated during the summer for flowering period, amount of bloom, trueness to type and plant disease resistance.

MATERIALS AND METHODS: The bedding plant evaluation for 1990 included 25 varieties of salvia, 5 varieties of dusty miller, 12 varieties of ageratum, 17 varieties of marigold, 37 varieties of petunia, 24 varieties of geraniums and 14 varieties of alyssum.

They were sown in a seed flat using the following sow dates: geraniums February 26, dusty miller March 5, salvia March 25, ageratum April 3, petunia April 4, alyssum April 11 and marigold April 11. The geraniums were transplanted March 14 into 6.5 cm fibre pots. The rest of the bedding plants were transplanted into 5.5 cm fibre pots on the following dates — Dusty miller March 26, salvia April 11, ageratum April 23, petunia May 10–20, alyssum April 28/29 and marigolds April 24. A 1 soil, 2 peat and 1 sand compost with slow release fertiliser was the growing media. They were grown at the Kentville Research Centre greenhouses. May 29, 30 the bedding plant transplants were planted into the outdoor trial beds.

The bedding plants were evaluated August 9, 1990 for quality of bloom, amount of bloom, quality of foliage, plant trueness to type, adaptability/resistance and bloom trueness to type.

RESULTS AND DISCUSSION: The dry growing conditions during the summer of 1990 did stress the bedding plants. The plants which were affected the most were the alyssum which was trimmed when it started to produce seed mid-summer and the marigolds which stopped flowering in August. An evaluation was not done on the marigolds due to poor flowering which is the first summer the marigolds did not perform well in the trials. The dusty miller was not evaluated using the standard forms but observations were made.

Brian Toms, Greenhouse Specialist, Plant Industry Branch, Truro has developed a new evaluation form to evaluate the bedding plants every two weeks to account for weather influences and provide an improved appraisal method.

The marigold varieties grown were: Naughty Marietta, Dainty Marietta, Granada, Cinnabar, Mini Marietta, Red Marietta, Burgundy Ripple, Little Nell, Moll Flanders, Instant Yellow, Disco Golden Yellow Imp., Ole, Viva, Disco Orange, Disco Marietta, Disco Red and Disco

Flame. The dusty miller varieties displayed were Silver Feather, Cirrus, Silver Lace, Silver Dust and Diamond.

CONCLUSIONS: Varieties of salvia, geranium, alyssum, ageratum, petunia and dusty miller were evaluated at the Kentville Research Station site for the regional bedding plant trial. Marigolds were included in the trial but not evaluated due to poor performance in August. The varieties are labelled and in an accessible location for the general public and growers to view during the summer. An open house was held August 22, 1990 for commercial growers to view the trials with handouts available listing all the varieties on trial. A garden club tour of the bedding plant trials was held in September.

Table 1: Ageratum Cultivar Trial — Kentville Field Evaluation

*id	qb	ab	fol	p.tt	ar	b.tt	total	%
Blue Lagoon	9	9	9	3	9	3	42	91.3
Blue Danube	8	9	8	3	8	3	39	84.8
Pacific Improved	8	9	8	3	8	2	38	82.6
Summer Snow	8	8	8	2	8	3	37	80.4
Blue Blazer	8	9	8	1	8	3	37	80.4
Madison	8	9	6	3	6	3	35	76.1
Ocean Improved	7	8	8	2	7	2	34	73.9
North Sea	7	8	7	2	7	2	33	71.7
Adriatic Improved	8	8	8	1	7	1	33	71.7
Blue Mink	6	8	8	2	7	2	33	71.7
Dwarf Blue Bedder	7	7	6	1	6	1	28	60.9
Bavaria	5	5	5	1	5	1	22	47.8

*id: plant name
qb: quality of bloom
ab: amount of bloom
fol: quality of foliage
p.tt: plant trueness to type
ar: adaptability/resistance
b.tt: bloom trueness to type
tot: total score (out of 46)
%: percentage score

Cultivars are arranged in descending order (by overall score)

Table 2: Alyssum Cultivar Trial — Kentville Field Evaluation

*id	qb	ab	fol	p.tt	ar	b.tt	total	%
Oriental Night	8	8	8	3	8	3	38	82.6
Navy Blue	8	8	8	3	8	3	38	82.6
Snow Cloth	8	8	8	3	8	3	38	82.6
Carpet of Snow	8	7	7	3	7	3	35	76.1
Midnight	7	7	8	3	7	3	35	76.1
Wonderland Rose	8	7	7	3	7	3	35	76.1
Snow Drift	8	7	7	2	7	3	34	73.9
Royal Carpet	7	7	7	3	7	3	34	73.9
Wonderland White	7	7	7	3	7	3	34	73.9
Rosie O Day	7	7	7	3	7	3	34	73.9
Easter Bonnet	8	8	8	3	1	3	31	67.4
Snow Cloth Select	6	7	6	3	6	3	31	67.4
Tiny Tim	5	5	5	2	5	3	25	54.3
Snow Crystals	4	4	4	3	4	3	22	47.8

*id: plant name
qb: quality of bloom
ab: amount of bloom
fol: quality of foliage
p.tt: plant trueness to type
ar: adaptability/resistance
b.tt: bloom trueness to type
tot: total score (out of 46)
%: percentage score

Table 3: Geranium Cultivar Trial — Kentville Field Evaluation

*id	qb	ab	fol	p.tt	ar	b.tt	total	%
Ringo Deep Red	9	9	9	3	9	3	42	91.3
Pinto Red	8	9	9	3	9	3	41	89.1
Scarlet Elite	8	9	9	3	9	3	41	89.1
Bandit Salmon	9	9	8	3	8	3	40	87.0
Bandit Red	8	9	8	3	9	3	40	87.0
White Elite	9	8	9	3	8	3	40	87.0
Orbit Rose	8	8	8	3	9	3	39	84.8
Elite Pink	8	8	8	3	8	3	38	82.6
Orbit Light Salmon	8	8	8	3	8	3	38	82.6
Tiffany	8	8	8	3	8	3	38	82.6
Multibloom Bright Rose	7	8	8	3	8	3	37	80.4
Cherry Elite	8	7	8	3	8	3	37	80.4
Multibloom White	8	7	8	3	8	3	37	80.4
Scarlet Eyes	8	8	7	3	8	3	37	80.4
Ringo Deep Scarlet	7	8	8	3	7	3	36	78.3
Multibloom Scarlet Eye	7	8	7	3	8	3	36	78.3
Orbit Hot Pink	7	7	8	3	8	3	36	78.3
Challenge White	8	7	8	3	7	3	36	78.3
Neon Rose	7	7	8	3	8	3	36	78.3
Multibloom Pink	7	7	8	3	8	3	36	78.3
Orbit Deep Salmon	8	8	8	1	8	3	36	78.3
Multibloom Lavender	8	8	7	3	6	3	35	76.1
Multibloom Salmon	7	7	7	3	6	3	33	71.7
Multibloom Red	7	6	6	3	6	3	31	67.4

*id: plant name
qb: quality of bloom
ab: amount of bloom
fol: quality of foliage
p.tt: plant trueness to type
ar: adaptability/resistance
b.tt: bloom trueness to type
tot: total score (out of 46)
%: percentage score

Table 4: Petunia Cultivar Trial — Kentville Field Evaluation

*id	qb	ab	fol	p.tt	ar	b.tt	total	%
Pink Madness	9	9	8	3	9	3	41	89.1
Rose Carpet	9	8	8	3	9	3	40	87.0
Pink Carpet	9	8	8	3	9	3	40	87.0
Rose Madness	9	8	8	3	8	3	39	84.8
Plum Blue	8	8	8	3	8	3	38	82.6
Polo Pink	8	7	8	3	8	3	37	80.4
Polo Salmon	8	7	8	3	8	3	37	80.4
White Imp Madness	8	8	8	3	7	3	37	80.4
Polo Red	9	7	7	3	8	3	37	80.4
Plum Purple	8	8	8	3	7	2	36	78.3
Sugar Madness	8	8	8	3	7	2	36	78.3
Celebrity Red	8	7	7	3	8	3	36	78.3
Plum Carpet	8	8	8	3	7	2	36	78.3
Plum Madness	8	8	8	3	7	2	36	78.3
Red Madness	6	8	8	3	7	3	35	76.1
Polo Deep Blue	8	7	7	3	7	3	35	76.1
Celebrity Hot Pink	7	7	7	3	7	3	34	73.9
Coral Madness	7	8	7	3	6	3	34	73.9
Burgundy Madness	7	8	8	3	7	1	34	73.9
White Carpet	6	7	7	3	7	3	33	71.7
Celebrity Salmon	6	7	7	3	7	3	33	71.7
Highlight Blue	7	7	7	2	7	3	33	71.7
Highlight Coral	6	7	7	3	7	3	33	71.7
Celebrity White	6	7	7	3	7	3	33	71.7
Summer Madness	6	8	7	3	6	3	33	71.7
Highlight Carmine	6	7	7	3	7	3	33	71.7
Red Carpet	6	7	6	3	7	3	32	69.6
Polo Burgundy Star	8	7	7	2	7	1	32	69.6
Sky Joy	6	7	6	3	7	3	32	69.6
Polo Velvet	7	6	6	3	7	3	32	69.6
Polo Blue Star	8	7	7	2	7	1	32	69.6
Polo White	6	6	7	3	6	3	31	67.4
Rose Parasol	6	6	6	3	7	2	30	65.2
Velvet Carpet	7	6	6	3	5	3	30	65.2
Star Joy	6	7	6	2	7	1	29	63.0
Starlight Joy	6	7	6	2	7	1	29	63.0
Sheer Madness	6	6	6	3	5	2	38	60.9

*id: plant name
qb: quality of bloom
ab: amount of bloom
p.tt: plant trueness to type
ar: adaptability/resistance
b.tt: bloom trueness to type
tot: total score (out of 46)
%: percentage score

Table 5: Salvia Cultivar Trial — Kentville Field Evaluation

*id	qb	ab	fol	p.tt	ar	b.tt	total	%
Empire Lilac	9	9	9	3	9	3	42	91.3
Carabiniere Blue	9	9	9	3	9	3	42	91.3
Empire Dark Salmon	9	9	9	3	9	3	42	91.3
Red Hot Sally	9	9	8	3	9	3	41	89.1
Sparkler	9	8	9	3	9	3	41	89.1
Cleopatra Purple	9	8	9	3	8	3	40	87.0
St. John's Fire	8	9	8	3	8	3	39	84.8
Red Pillar	8	7	8	3	9	3	38	82.6
Carabiniere Red	8	8	8	3	8	3	38	82.6
Scarlet Midget	9	9	6	3	8	3	38	82.6
Empire Lilac	8	8	8	3	8	3	38	82.6
White Fire	7	8	8	3	8	3	37	80.4
Blaze of Fire	8	6	8	3	9	3	37	80.4
Fireball	8	7	8	3	8	3	37	80.4
Little Tango	8	7	8	3	7	3	36	78.3
Carabiniere White	7	8	8	3	7	3	36	78.3
Carabiniere Scarlet	7	8	7	3	8	3	36	78.3
Cleopatra White	7	8	7	3	7	3	36	78.3
Carabiniere Orange	7	7	8	3	7	3	35	76.1
Violet Frame	7	8	7	2	8	3	35	76.1
Sky and Ice	7	7	8	2	8	2	34	73.9
Fire and Ice	7	7	8	2	8	2	34	73.9
Empire White	7	7	7	2	7	3	34	73.9
Scarlet Pimpernell	6	7	7	3	7	3	33	71.7
Inferno	6	7	6	1	6	1	27	58.7

*id: plant name
qb: quality of bloom
ab: amount of bloom
fol: quality of foliage
p.tt: plant trueness to type
ar: adaptability/resistance
b.tt: bloom trueness to type
tot: total score (out of 46)
%: percentage score

Cultivars are arranged in descending order (by overall score)

FLOWERING KALE AND CABBAGE SCHEDULE TRIAL

Bev MacPhail, Horticulturist
Kim Best, Technician

INTRODUCTION: Flowering kale and cabbage are grown for the ornamental and colorful foliage which develops under cool nights in early fall and remains decorative until winter. The planting schedule affects the size of the plant, risk of bolting and overall ornamental value. During the 1989 season seven sowing/planting dates were used starting with sowing April 24 and sowing approximately two weeks apart. With the scheduling trial in 1989 the plants sown June 16 — June 30th and planted outdoors July 15 — July 30th provided the best fall color without bolting.

The schedule trial for 1990 included four sow/plant dates with the first sow date being June 1 and the last July 13th.

MATERIALS AND METHODS: Four flowering kale and cabbage varieties — Emperor White — fringed leaf cabbage, Dynasty Pink — round leaf cabbage, Dynasty White — round leaf cabbage and White Peacock — feather leaf kale were grown with the following plant schedule.

Table 1. Flowering Kale and Cabbage Schedule Trial — 1990

Schedule	Sow	Plant
Schedule 1	June 1	June 28
Schedule 2	June 20	July 3
Schedule 3	June 27	July 27
Schedule 4	July 13	August 10

The four varieties were sown in a 126 plug tray in the greenhouse. A week before planting outdoors the transplants were placed in a coldframe.

RESULTS AND DISCUSSION: Schedule 1, 2 and 3 produced attractive sized plants with good color development. Schedule 4 plants were too small before color development and were not suitable when compared with schedule 1, 2 and 3. The four varieties started to show color the end of August and remained attractive until November.

CONCLUSIONS: Flowering kale and cabbage varieties should be sown between June 1 and June 30 in a greenhouse and transplanted outdoors June 25 to July 30 for attractive size and color development.

FLOWERING KALE AND CABBAGE 1990

Bev MacPhail, Greenhouse Specialist
Kim Best, Technician

INTRODUCTION: There are many new varieties of flowering kale and cabbage particularly from Japanese seed companies. Ornamental kale and cabbage are available in different colors and color combinations with interesting leaf forms. They provide color and contrast in the garden from mid-August until November. From the 21 varieties grown in 1989, ten of the best were selected for further evaluation.

MATERIAL AND METHODS: The ten varieties of ornamental kale and cabbage in Table 1 were sown in a 128 plug tray on June 27, 1990 in the greenhouse. The transplants were moved to a cold frame a week before planting in the outdoor plots July 27.

RESULTS AND DISCUSSION: Comments on the ten flowering kale and cabbage varieties are in Table 2. Photographs were taken of all the varieties for use at grower meetings and garden club talks.

The varieties started to develop color the end of August and remained colorful and attractive until November.

Table 1: Ornamental Kale and Cabbage

Variety	Color/Type	Seed Source
Dynasty White	round leaf cabbage/white center	Ball-Superior
Dynasty Pink	round leaf cabbage/pink center	Ball-Superior
White Pigeon	round leaf cabbage/white center	Takii
White Sparrow	dwarf fringed leaf cabbage/white center	Takii
White Kamone	dwarf fringed leaf cabbage/white center	Takii
White Feather	tall feather leaf kale/white centre	Takii
Emperor White	feather leaf kale/white centre	Ball-Superior
Peacock White	feather leaf kale/white centre	Takii
Peacock Red	feather leaf kale/red centre	Takii

CONCLUSIONS: The flowering kale and cabbage varieties that were the most attractive and colorful in the 1990 trials were the fringed leaf cabbage - White Sparrow, White Kamone and Emperor White and the feather kale Red and White Peacock.

The variety evaluation is in a location at the Kentville Research Station with good access to the general public. The trials were shown at a growers' tour day August 22 and at a garden club tour in September.

Table 2: Flowering Kale and Cabbage

Variety	Comments
Round Leaf Cabbage	
Dynasty White	fair color development
Dynasty Pink	bolted, fair color development
White Pigeon	fair color development
Fringed Leaf Cabbage	
White Sparrow	good color, attractive
White Kamone	good color, attractive
Emperor White	good color
Feather Kale	
White Feather	fair color development
Peacock White	good color
Peacock Red	late development, good color

IMPATIENS NEW GUINEA HYBRID SPECTRA

Beverley MacPhail, Greenhouse Specialist
Kim Best, Technician

Abstract

New Guinea hybrid impatiens were developed from plants found in New Guinea by plant explorers Harold Winters and Joseph Higgins on a jointly funded exploration between U.S. Department of Agriculture and Longwood Garden. in 1970 Dr. Richard Armstrong, Longwood's geneticist started cross-pollinating and self-pollinating 25 specimens of New Guinea impatiens.

INTRODUCTION: The New Guinea hybrids that have been developed have large flowers with a wide color range and a defined variegated leaf which produces a mass of color. New Guinea hybrids are compact, sturdy plants that tolerate hot, sunny locations. Plant suppliers have released several series of New Guinea impatiens such as Sunshine patented group by Mikkelsen's Inc. and Kientzler cultivars from Paul Ecke Ranch.

These patented selections are only available as cuttings from the suppliers or brokers.

Research work on developing a New Guinea impatiens from seed led to Tango, 1988 All America winner. Tango is a bright orange flowered plant but has no variegation in the leaf color and is available in the one color.

Spectra, released in 1990, is a New Guinea impatiens available from seed in a full range of flower color with 40% of the plants with variegated leaves.

MATERIALS AND METHODS: A trial package of Spectra was grown at the Nova Scotia Department of Agriculture and Marketing greenhouses at the Kentville Research Station for display. The seeds were sown February 27, 1990 into a 128 plug tray using a soilless compost. The seedlings were placed under a high pressure sodium lamp for three weeks. They were planted into 100 mm pots April 23. Early June hanging baskets and a vertical wire planter were planted for display use at the Kentville Research Station. June 28, an outdoor bed was planted with the Spectra New Guinea impatiens.

RESULTS: The flower color range was paler than the intense color available from the varieties from cuttings. The leaf variegation developed with the maturity of the plants with 40 — 50% of the plants exhibiting bicolored foliage. The plants were compact and well branched making an attractive 100 mm pot and hanging basket. The vertical planters with Spectra impatiens in front of the Kentville Research Station provided a colorful display all summer and received favourable comments. The Spectra impatiens in the outdoor beds suffered with dry growing conditions during the summer.

Spectra New Guinea Impatiens has attractive flower and foliage colors with a compact habit which is suitable for pot production, hanging baskets and containers.

GARDEN MUMS FOR MOTHER'S DAY

Bev MacPhail, Greenhouse Specialist
Kim Best, Agricultural Technician

Abstract

Ten garden mum varieties, Nicole, Tolima, Jessica, Goldmine, Naomi, Debonair, Dark Grenadine, Ginger, Minnautumn and Bravo were grown under two treatments (1) natural day length and (2) light and shade program in 100 mm pots for Mother's Day sales. The flower dates were recorded for the two treatments with Ginger, Nicole, Jessica, Naomi and Tolima flowering too early for peak Mother's Day sales while Minnautumn, Dark Grenadine, Debonair, Bravo and Goldmine in both treatments were salable for Mother's Day. All ten varieties were suitable for 100 mm pot production in the spring and when planted outdoors will reflower in the fall.

INTRODUCTION: Garden chrysanthemums are grown as a flowering potted plant for Mother's Day and later can be planted outside for reflowering in the fall. Ten garden mum varieties were grown under two treatments (1) natural day length and (2) light and shade program to determine flower dates. Chrysanthemums require short days to flower and so with the increasing day length in the spring the mums may require manipulation of the day length to flower on schedule. After flowering the ten garden mum varieties were planted outdoors to determine their ability to reflower in the garden.

MATERIALS AND METHODS: Ten rooted cuttings of ten garden mum varieties, Nicole, Tolima, Jessica, Dark Grenadine, Minnautumn, Ginger, Goldmine, Debonair, Naomi and Bravo were planted in 100 mm pots March 12th. Five pots were grown under natural day length and five were lighted between 22:00 - 2:00 with artificial light. On March 28th all the plants were given a hard pinch and the lighting was stopped on the light/shade treatment plants and shading with black plastic started from 16:30 to 8:00 a.m. The plants were fed with a water soluble fertilizer on a regular basis. Flowering dates were recorded between April 26 — May 7.

June 28 the ten varieties were planted outdoors for evaluation.

RESULTS AND DISCUSSION: The salable flower dates (60% open on individual flowers) for the ten garden mum varieties in the two treatments (1) light/shade and (2) natural day length are found in Table 2.

The flower dates were similar for the light/shade and natural day length treatment. The majority of Mother's Day sales occur one week before and including Mother's Day. Ginger, Nicole, Jessica, Naomi and Tolima flowered too early for peak Mother's Day sales while Minnautumn, Dark Grenadine, Debonair, Bravo and Goldmine in both treatments were salable for Mother's Day, May 13, 1990.

The garden mums grown under the light/shade treatment were scheduled to flower one week before Mother's Day so the varieties that flowered earlier will require adjustments to the light/shade dates. Garden mums are very productive and not entirely photoresponsive so may set hard regardless of the hours they are lighted.

All ten varieties were attractive, salable plants in 100 mm pots.

They were planted outdoors June 28th and flowered in the plots during mid-September and October.

Table 1: Garden Mums

Variety	Color/Type	Week Response**
Nicole*	white-ivory decorative	7 week
Tolima	white decorative	7 week
Jessica*	bright yellow decorative	7 week
Goldmine	golden-yellow formal pompom	7 week
Naomi*	pink-bicolor spoon-tip daisy	7 week
Debonair	dark lavender decorative	7 week
Dark Grendaine*	coral red decorative	7 week
Ginger	two-tone bronze decorative	7 week
Minnautumn	red-bronze decorative	7 week
Bravo	red decorative	7 week

* new for 1990

** week response — time to flower from shade date

Table 2: Flower Dates for Mother's Day Garden Mums

Variety	Light/Shade	Natural Day
Nicole	April 30	May 2
Tolima	April 30	April 30
Jessica	April 30	April 30
Goldmine	May 7	May 7
Naomi	May 2	May 2
Debonair	May 7	May 2
Dark Grenadine	May 7	May 7
Ginger	April 26	April 26
Minnautumn	May 7	May 7
Bravo	May 7	May 7

Note: Mother's Day — May 13, 1990

CONCLUSION: The ten garden mum varieties should be grown again to refine the production schedule for Mother's Day sales. The production schedule including planting, pinch, light/shade dates should be adjusted for Ginger, Nicole, Jessica, Naomi and Tolima for flowering to occur one week before Mother's Day. All ten varieties were suitable for 100 mm pot production in the spring and when planted outdoors will reflower under natural day length conditions in the fall.

GARDEN MUM VARIETY EVALUATION

Bev MacPhail, Greenhouse Specialist
Kim Best, Technician

Abstract

Fourteen varieties of garden mums — Tolima, White Stardom, Nicole, Jessica, Donna, Target, Naomi, Debonair, Grace, Sarah, Dark Grenadine, Sundora, Red Remarkable and Minngopher were planted as rooted cuttings May 30th into 606 pacs, 150 mm pots, six litre pots and 22.4 cm hanging baskets. The garden mums grown in 150 mm pots were grown (1) as a shaded crop which flowered August 16 - 30 with the exception of Sarah which flowered September 13 and (2) under natural day length conditions with the flower dates ranging from August 26 to October 24. Each variety was evaluated in a 22.4 cm hanging basket. Display beds containing the 14 varieties were established at Nova Scotia Agricultural College and Annapolis Royal Historic Gardens to promote garden mums.

INTRODUCTION: Garden chrysanthemums are a versatile floriculture crop which can be sold in the spring as a green or flowering pot plant and during the summer and fall in a large selection of containers that provide beautiful fall color in the garden. Garden mums would offer new sales opportunity for greenhouses and garden centres during the late summer, early fall.

Fourteen varieties of garden mums from Yoders Canada Ltd. (seven new for 1990) were evaluated in 606 pacs, 150 mm pots, six litre pots and hanging baskets. The garden mums in 150 mm pots were grown under two treatments light/shade and natural day length. The light/shade treatment should flower earlier than the natural day length thus providing a longer flowering period from the same plant date. To promote the use of garden mums in Nova Scotia demonstration beds were planted at the Annapolis Royal Historic Gardens and the Nova Scotia Agricultural College.

MATERIALS AND METHODS: May 30 rooted cuttings of the following fourteen garden mum varieties were planted:

Variety	Color/Type
Tolima	white decorative
White Stardom	white daisy
Nicole*	white-ivory decorative
Jessica	bright yellow decorative
Donna*	bright yellow spoon-tipped daisy
Target	dark yellow decorative
Naomi*	pink-bicolor spoon-tip daisy
Debonair	lavender decorative
Grace*	orange daisy
Sarah*	golden bronze quilled decorative
Dark Grenadine	coral red decorative
Sundora	rose wine decorative
Red Remarkable	red decorative
Minngopher	red decorative cushion habit

* new for 1990

The amount and container size are listed below:

- 6 — 150 mm pots — light/shade treatment
- 4 — 150 mm pots — natural day length treatment
- 4 — 6 litre containers
- 2 — 22.4 cm hanging baskets
  3 cuttings on the top, 4 around the side
- 10 — cuttings in 606 pacs for Nova Scotia Agricultural College
- 12 — cuttings in 606 pacs for Annapolis Royal Historic Gardens

A soilless compost was used with regular feeding with a water soluble fertilizer 15-15-18.

June 11 and 12 garden mums in 606 pacs were delivered to NSAC and Historic Gardens for direct planting outdoors. Recommendations were made to pinch the plants several times until mid-July.

The remaining garden mums were grown in the greenhouse and hand pinched twice June 13 and June 29 with the remaining beingdone on July 3. July 9 shading was started on six of each variety in a 150 mm pot with black plastic to exclude light from 19:00 — 8:00 a.m. five days out of seven. The shading for thirteen hours every five days out of seven continued until August 10 when flower color was visible.

The flower dates were recorded and observations made on suitability to different container sizes and outdoor performance.

RESULTS AND DISCUSSION: Garden mums will flower naturally when the day length is less than 12 hours but shading the plants for over 12 hours per night will also artificially create short days. The fourteen garden mum varieties were grown under the two treatments (1) light/shade and (2) natural day length to record the flower dates and compare with the supplier's recommendations which are for 40° latitude in Middle Atlantic States/Ohio climate.

Note: Natural Flower Date: Yoders Inc. — the supplier of these varieties list an approximate flowering date for each variety when grown outdoors under natural day length at 40° latitude in Middle Atlantic States/Ohio climate.

Table 1. "Garden Mums Light/Shade Program" compares the week response listed in the suppliers catalogue with the recorded week response and flower date. Nicole, Target, Grace flowered earlier than the scheduled flower date and Sarah was later than expected. White Stardom, Tolima, Donna, Jessica, Naomi, Debonair, Sundora,Minngopher, Dark Grendaine and Red Remarkable all flowered within the expected schedule. The short day treatment started flowering within a two week period August 16 — August 30 with the exception of Sarah which began blooming Sept. 13.

Table 2: "Garden Mums Natural Day Length" compares the natural flower date listed in the supplier catalogue with the flower date recorded in the greenhouse at the Kentville Research Station. There were three varieties, Jessica, Donna and Dark Grenadine, with the natural flower date and the recorded flower date within seven days of each other. The difference between the natural flower date and recorded flower date could be due to the different growing

environments and latitude. Kentville is at 45° latitude. The garden mums should be grown again outdoors to record flower dates.

The hanging baskets, 22.4 cm size were modified with four 3 cm holes cut at approximately half the height of the pot and evenly spaced around the pot. Three cuttings were planted on top and one cutting placed in each of the four holes. The garden mums in hanging baskets grew into a mass display of blooms with only the bottom of the pot visible. Red Remarkable, Sundoro, Target and Grace were too tall in the hanging baskets to form a neat mound of flowers so would require adjustments to the production schedule and/or an application of growth regulator.

Table 3 lists the varieties that were suitable for hanging baskets with the production schedule used.

The cuttings in 606 cell pacs were established in the greenhouse for 12 days before delivery to NSAC and Historic Gardens. The cuttings planted outdoors at the NSAC and Historic Gardens were pinched several times during the spring and mid-summer. All fourteen varieties produced strong healthy plants and flowered mid-September and October. They provided a very colorful fall display in two locations visible to the general public.

CONCLUSION: Garden mums grown from cuttings received in the spring can be grown in different size containers, in a greenhouse or outside and the flower date can be altered by shading thus providing a grower many options for sales opportunities.

Acknowledgement: Special thanks to Yoder Canada for donating the garden mum cuttings and arranging delivery.

Table 1: Garden Mums Light/Shade Program

Variety	Week Response Per Supplier	Recorded Week Response At Kentville	Recorded Flower Date
White			
Nicole	7 week	5.5 week	Aug. 16
White Stardom	7 week	6.5 week	Aug. 23
Tolima	7 week	7.5 week	Aug. 30
Yellow			
Target	7 week	5.5 week	Aug. 16
Grace	7 week	5.5 week	Aug. 16
Jessica	7 week	6.5 week	Aug. 23
Donna	7 week	7.5 week	Aug. 30
Sarah	8 week	9.5 week	Sept. 13
Purple			
Naomi	7 week	6.5 week	Aug. 23
Debonair	7 week	6.5 week	Aug. 23
Sundoro	7 week	7.5 week	Aug. 30
Bronze			
Minngopher	6 week	6.5 week	Aug. 23
Dark Grenadine	7 week	7.5 week	Aug. 30
Red			
Red Remarkable	7 week	7.5 week	Aug. 30

Note: Week response is time to flower date from shade date.

Table 2: Garden Mums Natural Day Length program

Variety	Natural Flower Date Per Supplier	Recorded Flower Date At Kentville
White		
Nicole	Sept. 24	Aug. 29
White Stardom	Sept. 24	Sept. 12
Tolima	Sept. 25	Oct. 17
Yellow		
Target	Sept. 18	Oct. 10
Grace	Sept. 24	Sept. 5
Jessica	Sept. 18	Sept. 26
Donna	Sept. 25	Sept.26
Sarah	Oct. 4	Oct. 24
Purple		
Naomi	Sept. 25	Oct. 10
Debonair	Sept. 22	Sept. 12
Sundoro	Sept. 28	Oct. 17
Bronze		
Minngopher	Sept. 20	Aug. 29
Dark Grenadine	Sept. 25	Sept. 26
Red		
Red Remarkable	Oct. 1	Oct. 24

Table 3: Garden Mums Suitable for Hanging Baskets

Suitable	Requires Height Control
Jessica	Red Remarkable
Dark Grenadine	Sundoro
Nicole	Target
Minngopher	Grace
Debonair	
Naomi	
Donna	
White Stardom	
Sarah	
Tolima	

GRAPHICAL TRACKING FOR POINSETTIA HEIGHT CONTROL

Bev MacPhail, Greenhouse Specialist
Kim Best, Technician

Abstract

The poinsettia variety 'Lilo' was grown under three temperature conditions: (1) growth chamber 1-24°C day/21°C night; (2) growth chamber 2-22.5°C constant; and (3) greenhouse — 18°C day/15°C night in a 150 mm pot for Christmas 1990. Growth curve graphs were prepared with acceptable minimum and maximum final heights (35–40 cm) with poinsettia growth measured and plotted every three days after pinch date. Poinsettias grown with a 21°C night/24°C day temperature were an acceptable final height while the plants grown at 22.5°C constant temperature were shorter than the miminal height. Graphical tracking can be used to determine if the crop height is within acceptable height requirements during the growth of the crop.

INTRODUCTION: Graphical tracking is a technique that monitors greenhouse pot crop growth on a regular basis and compares the growth with the minimum and maximum desirable height growth curves for this crop. The initial plant height and desired minimum and maximum final plant height are plotted on a graph which provides a range of acceptable plant height for the production time of the crop. Plant height is measured at regular intervals and the actual height is plotted on the graph. If actual height does not plot between the acceptable range, corrective actions must be taken to alter the rate of stem elongation. There are several options to alter stem elongation - including growth regulators and manipulation of temperature.

A new poinsettia variety Lilo was grown for Christmas 1990 with three temperature treatments (1) growth chamber 1–21°C night/24°C day (2) growth chamber 2–22.5°C constant night/day and (3) greenhouse–15°C night/18°C day.

Growth curves were prepared for poinsettias in a 150 mm pot with the minimum final height 35 cm and maximum final height 40 cm. The height was measured and plotted for a sample of poinsettias in each treatment. A few temperature adjustments were made during the growth of the crop.

The use of graphical tracking to monitor pot plant growth and to make timely corrections is a new concept for greenhouse production so the authors wanted to gain experience with the process.

MATERIALS AND METHODS: Rooted cuttings of the poinsettia variety Lilo were planted August 27, 1990 into 150 mm pots and 16 placed in each treatment (1) growth chamber 1–21°C night/24°C day (2) growth chamber 2–22.5°C constant night/day and (3) greenhouse. Chamber 1 and 2 received the same average daily temperature, 22.5°C, during the growth of the crop. Chamber 2 was at a constant day and night temperature of 22.5°C while chamber 1 was at 12 hours x 21°C and 12 hours x 24°C for an average daily temperature of 22.5oC.

The greenhouse was unheated until September 11 when the temperature was set at 15°C night and 18°C day but daily temperature fluctuations occurred under ambient light conditions. The two growth chambers had 2500 foot/candles of light for 13 hours.

A soilless compost was used with regular feeding with a water soluble fertilizer. The plants were misted several times a day for the first week after planting to help establish the cuttings.

Whiteflies were present and several sprays were applied for control. Yellow sticky traps were used to monitor the white fly population.

All plants were pinched September 10th. After the pinch date a sample of four plants in each treatment were measured every three days with the results plotted on the graph.

On September 26 the daylength in the two growth chambers was reduced to 11 hours for flower initation under short days.

The temperature was reduced in Chamber 1–24°C day/21°C night on November 19 to 16°C constant temperature.

RESULTS AND DISCUSSION: *Graph 1, Chamber 1* — 24°C day/21°C night plots the growth of the poinsettias from Sept. 11 until Nov. 27/90. The growth of the poinsettias grown under 24°C day/21°C was taller than the maximum growth curve until Oct. 5 when the growth curve fell within the minimum and maximum growth limits. The height on Nov. 6 and 13 was at the maximum height range so on November 19 the temperature was reduced to 16°C day/night with the final crop's height within the desired height range.

Graph 2, Chamber — 2 22.5°C constant day/night plots the growth of the poinsettias from Sept. 11 until Nov. 27/90. The plant height was above the maximum height until Sept. 28 when growth was reduced and from Oct. 5 until Nov. 27 the height was below the minimum desired height.

Graph 3, greenhouse — 18°C day/night 15°C night plots the growth of poinsettias in the greenhouse. On Sept. 28 the growth curve was below the minimum growth curve and continued below the desired height for the crop life.

Chamber 1 and 2 received the same average daily temperature, 22.5°C, during the growth of the crop with the poinsettias grown under 24°C day and 21°C night finishing within the desired height range and the poinsettias grown under 22.5°C constant day/night well shorter than the minimum height.

In the article "Get the plant height you want with graphical tracking", authors William Carlson and Royal Heins (1) discuss the use of temperature to reduce or increase plant height. Stem elongation and plant height respond to the difference between night and day temperature. Plants grown with a positive difference (warm days and cool nights) are taller than plants grown with a negative difference (cool days and warm nights).

Chamber 1 with a night temperature of 21°C and a day temperature of 24°C had greater stem elongation and a taller final height than the poinsettias grown in Chamber 2 with a constant day/night temperature of 22.5°C. The difference in a warmer day temperature and a cooler night temperature would account for the taller plants versus the poinsettias' growth under a constant day/night temperature.

The poinsettias in the greenhouse did not have any additional heating until Sept 11 with the start of greenhouse heating. The average daily temperature in the greenhouse was 17.5°C which was lower than both growth chambers at 22.5°C and resulted in poinsettias shorter than the accepted minimum height. The poinsettias in the greenhouse were grown below the recommended temperature which demonstrates that a lower daily average temperature affects the rate of vegetative growth.

CONCLUSIONS: Graphical tracking is a method poinsettia growers can use to determine if the crop height is within acceptable height requirements during the growth of the crop.

Stem elongation and plant height are affected by the average daily temperature and the difference between day and night temperature.

Poinsettias in the greenhouse grown at a lower than recommended daily average temperature were shorter than the accepted minimal height.

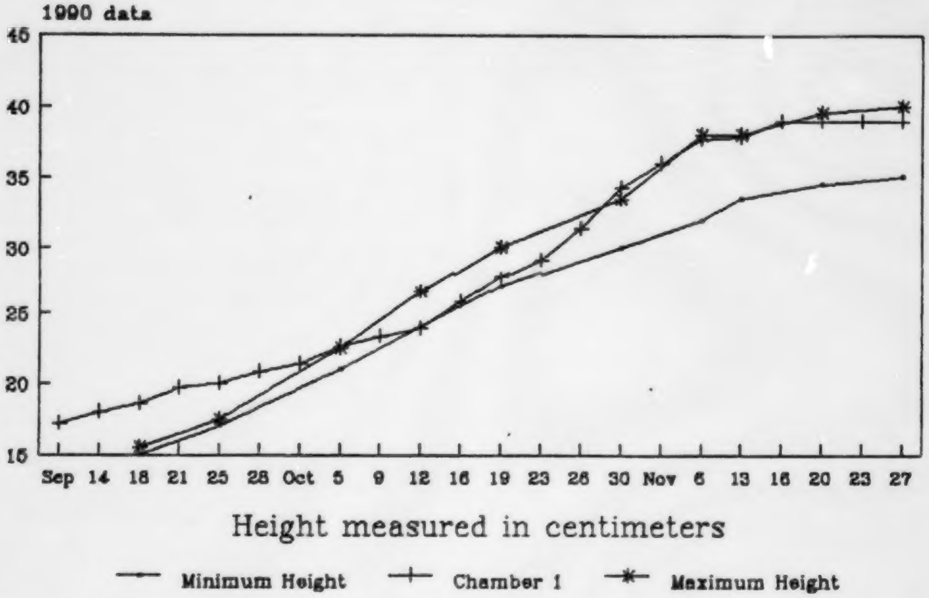
Poinsettias grown with a 21°C night/24°C day temperature were an acceptable final height while the plants grown at 22.5°C constant temperature were shorter than the minimal height even though both crops received the same average daily temperature.

REFERENCES:

William H. Carlson and Royal Heins, Get the plant height you want with graphical tracking, Grower Talks, January 1990.

Graphical Tracking – Poinsettia

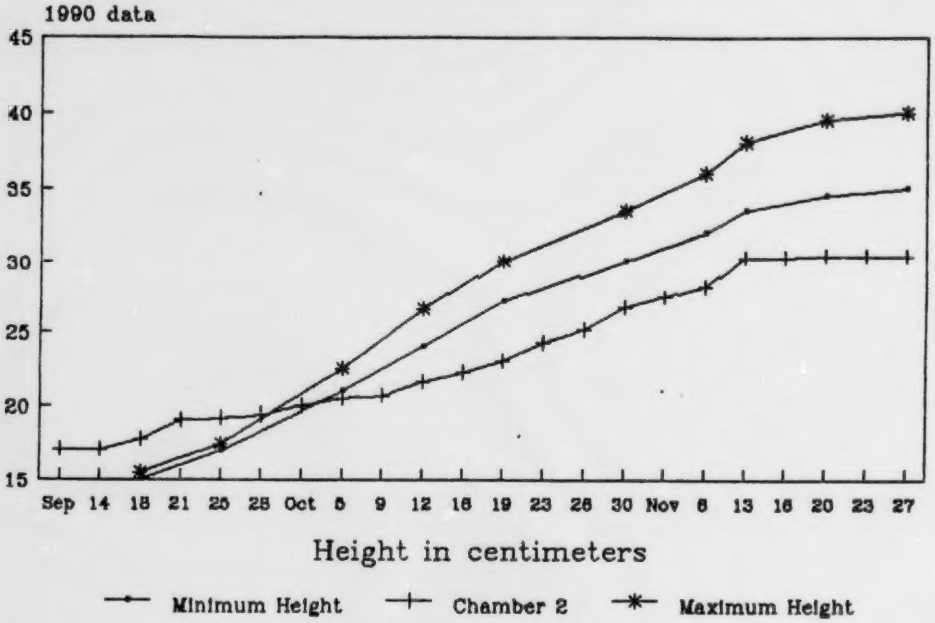
Chamber 1 – Temperature 24Day/21Night



Temp. dropped to 16 constant Nov. 19

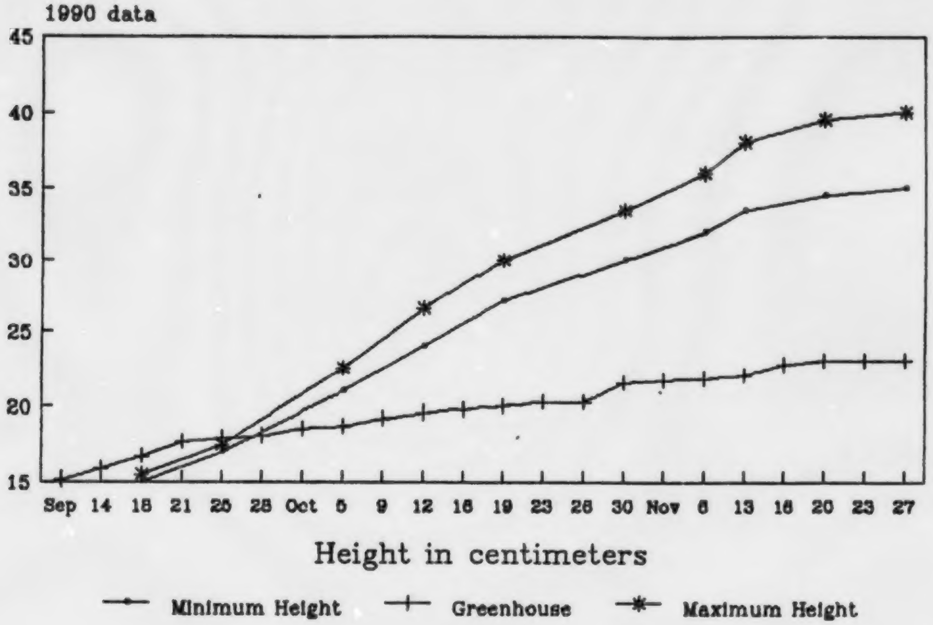
Graphical Tracking Poinsettias

Chamber 2 – Temperature 22.5 constant



Graphical Tracking Poinsettias

Greenhouse - Temperature 18Day/15Night



TURF TRIALS — VARIETY EVALUATION

Richard S. Morton, Horticulturist — Ornamentals
Les Blackburn, Agricultural Technician
Peter McCabe, Summer Assistant

Abstract

Bluegrass, bentgrass, ryegrass, fescue and mixtures are evaluated in an ongoing trial of 145 turfgrass varieties. The trials were developed in the 1960's to obtain information on varieties under Atlantic growing conditions and provided information for specialists, teachers, growers and the general public. Twenty-one varieties were entered into the trials in 1990. Those showing exceptional performance were as follows: Princeton P-104 and Georgetown Kentucky bluegrasses; Aquarius perennial ryegrass; Rebel Jr. and Rebel II tall fescues; Crystal, Bilgart and Reliant fine fescues and a mixture containing Tribute tall fescue (90%) and Princeton P-104 Kentucky bluegrass (10%).

MATERIALS AND METHODS: Trials are laid out in a block of one meter by two meter plots with one or more replications. Each year new varieties are entered in the trials for evaluation. These varieties are supplied by seed companies from around the world. These trials function as an Atlantic area test and information is exchanged with test centers in Canada and the United States. Maintenance is carried out in a normal manner for turf regarding mowing, fertilizer, weed control, land preparation and seeding. Records are generally taken five or six times during the year and a detailed annual report is available. Records are generally taken for five years on trials. After this, invasions of other grasses may make results unreliable. Records are based on colour, general appearance, germination and other factors.

RESULTS AND DISCUSSIONS: This year the records of the promising varieties will be made available to the landscape and sod industry. Sod growers in the province arrange to visit the trials each year for updating and information on which they base their mixtures of turfgrass for seeding. Information from these trials is a great help in producing publications and fact sheets. This information also helps NSAC students, short course students as well as the recreational people in golf and sports fields.

CONCLUSION: The twenty-one varieties in this year's test revealed nine promising varieties for turf work. The comparison of these to varieties under long term tests will help evaluate if these varieties should be included in new seeding. It is believed that Princeton P-104 Kentucky bluegrass will be widely used because of its aggressiveness and colour. Rebel Jr. tall fescue will lend itself to use in mixtures.

Comparison — Best Variety Ratings

A rating of 1–10 (best) is used for comparison

Bluegrass Princeton P-104	7.4
Kentucky bluegrass Georgetown	7.4
Perennial ryegrass Aquarius	7.5
Tall fescue Rebel Jr.	7.5
Tall fescue Rebel II	7.3
Fine fescue Bilgart	7.4
Fine fescue Reliant	7.4
Fine fescue Crystal	7.4
Mixture Tall fescue Tribute (90%) Kentucky bluegrass Princeton P-104 (10%)	7.4

EVALUATION OF DAYNEUTRAL STRAWBERRIES

Robert A. Murray, Senior Horticulturist — Berry Crops

Abstract

A two year dayneutral strawberry project was established by Terry and Dianne Wenham, Bass River, Colchester County to determine the performance of four dayneutral cultivars to extend the strawberry marketing season. The cultivar Selva was planted in 1988 and cultivars Tribute, Fern and Hecker were planted in 1989. The harvest season was from August 16 to October 1, 1989. The cultivar Tribute was the highest yielder. In a consumer panel, Fern was the first choice. Market response was very favourable from the wholesalers and consumers. In 1990, fruit yields were recorded from the 1989 planting of Tribute and Fern and from the 1990 planting of Selva. The harvest season in 1990 was from August 16 to October 20. Again the cultivar Tribute was the highest yielder.

INTRODUCTION: Dayneutral strawberries are uniquely different from June bearing strawberries. Dayneutrals flower and fruit continuously when temperatures are moderate because they are insensitive to day length, which normally controls flower initiation. Dayneutral strawberries are relatively new as the first cultivars were released in 1980. This project is designed to evaluate a semi-commercial planting consisting of four dayneutral cultivars for an extended market season. The project was initiated and conducted by Terry and Dianne Wenham, RR#1, Bass River, Colchester County, Nova Scotia, B0M 1B0.

MATERIALS AND METHODS: In mid-May 1989, one half acre planting of Tribute (2,000), Fern (2,000), and Hecker (1,500) was established. Plantings were made in double rows with eleven (11) inches between plants. Straw mulch was spread around the plants after planting. All blossoms were picked off for six weeks after planting. All runners were removed. The plants received monthly applications of nitrogen, Harvest Plus 14-4-6 and ammonium nitrate. Frequent applications of the insecticide Cymbush were applied for tarnished plant bug and the fungicide Equal was applied for fruit rot. Overhead irrigation was used to maintain adequate moisture.

A floating row cover, Agronet, was used in late September — early October in an attempt to extend the fall harvest season.

The cultivar Selva, planted in 1988, was included in the fruit evaluation for 1989.

In mid May 1990, 3,000 Selva were planted. The same treatments were applied to the 1990 planting of Selva as to the new 1989 plantings. Both the 1989 and 1990 plantings were treated alike for plant nutrition and crop protection. The cultivar Hecker was eliminated for the 1990 fruit yields. Yields were recorded from Tribute, Fern and Selva.

A French tunnel, 16 feet by 250 feet, using Durotherm plastic was established over the cultivar Tribute from September to October 18, 1990.

RESULTS AND DISCUSSION: Dayneutral strawberries were havested from August 16 to October 1, 1989.

Marketable yields of these cultivars were:

Tribute	0.49 pint per plant
Selva	0.30 pint per plant
Fern	0.24 pint per plant
Hecker	0.15 pint per plant

Non-marketable fruit accounted for 12.5%. Cultivars, Fern and Hecker, were not well established which could have contributed to lower yields.

A floating row cover was established September 14, 1989, in an attempt to extend the fall season. The row cover increased the inside temperature by 2°C; however, not sufficient to prevent frost damage to the fruit. Considerable fruit was left on the plants which was not able to be harvested after October 1 due to heavy frost.

Labor and harvesting costs of dayneutrals were higher than June bearers. Pickers were paid 25¢ per pint compared to 30¢ per quart for June bearers, mainly because yield per plant was lower at each picking date. The fruit did not ripen as fast as June bearers. All fruit was repacked before shipping to ensure quality at the market as there was more non-marketable fruit from the dayneutrals.

The cost to supervise, pick and repack was 35¢ per pint.

Market response to dayneutrals was very positive from the wholesalers and consumers. Three cultivars (Tribute, Fern and Hecker) were taste tested at the Harvest Food Fest, September 9–10, 1989, Truro, Nova Scotia.

First choice was:

Fern	48.5%
Tribute	28.2%
Hecker	23.3%

Intend to purchase:

Often	57.6%
Sometime	42.4%

Willingness to pay more:

Yes	82.8%
No	17.2%

In year two of the project, the dayneutrals were harvested from August 16 to October 20, 1990.

Marketable yields of these cultivars were:

Tribute	0.37 pints per plant
Fern	0.27 pints per plant
Selva	0.11 pints per plant

Tribute was the only cultivar picked after September 30th. Non-marketable fruit accounted for 15%.

The overall performance of the dayneutrals was not as good as expected. It is expected that fertility levels or the timing of fertilizer applications may be out of balance. The Selva cultivar did not have many blossoms and Fern had at least 50% sterile blossoms on the second late summer flush.

In 1990, it cost 56¢ per pint to pick and package for the market, of which packaging material cost 21¢ per pint. It costs 12¢ per plant to hand plant, and to remove the first flush of blossoms and runners.

The market response in 1990 was better than 1989. Consumer advertising is required to sell larger quantities of local fresh strawberries out of season at a higher price.

CONCLUSION: The Tribute cultivar was the most productive; however, the Fern cultivar was the prefered first choice with the public in a consumer preference test.

The grower was not satisfied with the 1989 and 1990 production results. The grower felt more attention must be given to plant culture and management of dayneutrals. Yields must be increased if the growing of dayneutrals is to be viable.

A new project will be established in 1991 to examine French plastic tunnels to extend the harvest season into the fall.

ACKNOWLEDGEMENTS: Special thanks to the Canada/Nova Scotia Agri-Food Development Agreement for partial funding under the Technology Introduction and Evaluation Program; and to Linda MacDonald and Heather MacKenzie, Marketing Services, Nova Scotia Department of Agriculture and Marketing, Truro, for the consumer test panel.

VITICULTURE LEAF CUTTER

Robert A. Murray, Senior Horticulturist — Berry Crops

Abstract

An ERO-Sicklebar Leaf Cutter was introduced and evaluated on a 20 acre vineyard by Jost Vineyards Ltd., Malagash, Cumberland County, during the summer of 1990. The *ERO-Sicklebar Leaf Cutter* greatly reduced labor costs, improved fungicide and sunlight penetration, and reduced vine damage from the use of tractor and machinery during the growing season.

INTRODUCTION: Summer pruning to remove excessive grape vine vigor is a labor intensive and costly vineyard operation. In European vineyards, mechanical sicklebars have reduced the labor costs. This project to evaluate the *ERO-Sicklebar Leaf Cutter,* manufactured by ERO Machinery, West Germany, was initiated and conducted by Jost Vineyards Ltd., Malagash, Cumberland County.

MATERIALS AND METHODS: The *ERO-Sicklebar* was attached to a 2155 John Deere 43HP tractor. There are two sicklebars, a verticle and a top horizontal. Summer pruning was done from mid July to early August on all cultivars in a 20 acre vineyard.

RESULTS AND DISCUSSION: Trimming time was two acres per hour. Trimming was done at the same time with light soil cultivation to maximize time efficiency. On more vigorous vines, pruning was done a second time.

The Leaf Cutter gave the vineyard a very neat appearance and made the grapes more visible to both inspection and the sun's rays.

The benefits resulting from the use of the Leaf Cutter include:

1. (a) the machine will trim two acres per hour compared to one person per acre per day
   (b) reduce harvesting costs by 48 percent as fruit is more accessible and visible to pick
   (c) reduce winter pruning costs by 10-20 percent as there is less wood to prune and remove
2. Improved fungicide penetration
3. Should reduce mildew infection as ventilation should be improved
4. Greater sunlight penetration on the wood should improve wood hardness
5. There is less vine damage from equipment travelling the rows
6. There is improved vision to operate the grape hoe

The operator had to be careful using the top horizontal sicklebar as some of the posts were not of even height. Jost feels that the top horizontal sicklebar is not essential for the cultivars grown in this vineyard.

An 18HP tractor can be used to operate the *ERO-Sicklebar Leaf Cutter.*

CONCLUSION: *The ERO-Sicklebar Leaf Cutter* is highly recommended to reduce vineyard labor costs, to improve fungicide penetration and to improve vine hardiness.

ACKNOWLEDGEMENTS: Appreciation is extended to Canada/Nova Scotia Agri-Food Development Agreement for partial funding under the Technology Introduction and Evaluation Program and to Jost Vineyards Ltd. for demonstrating this equipment to the Nova Scotia Grape Growers Association on their North Shore tour on August 30, 1990.

EVALUATION OF M9 EMLA AND M26 EMLA ROOTSTOCK

W.E. Craig, Horticulturist
J.Arnold, Technician

Abstract

Yields of Marshall, Blackmac and Summerland McIntosh and Spartan on M9 EMLA and M26 EMLA are compared. Fruit sise and color of the three McIntosh strains are compared for both rootstocks in a commercial apple orchard planted in 1984.

INTRODUCTION: Commercial apple orchard plantings on the rootstock M9 in Nova Scotia during the 1970's were unsuccessful. The failure of these plantings was attributed to lack of vigor of the M9 and/or poor management. Virus free M9 EMLA were introduced by the East Malling Research Station and Long Ashton Research Station. Virus free rootstocks are more vigorous than virus infected ones and reports indicate that trees on M9 EMLA may be as much as 50 per cent larger than those on M9. Peter VanOostrum, a local apple producer who has been successful with dwarf plantings on M26, expressed an interest in the M9 EMLA rootstock.

Therefore a small orchard planting was set out on his farm using the rootstocks M9 EMLA and M26 EMLA to obtain information on performance of M9 EMLA under Nova Scotia climatic conditions. The trial also allowed for the comparison of three red strains of non-spur type McIntosh.

MATERIALS AND METHODS: One year old trees on M9 EMLA and M26 EMLA rootstocks were planted in 1984 on a coarse-textured sandy loam in Canard, Kings County. The planting consists of three non-spur type McIntosh strains, Marshall, Summerland and Blackmac, and Spartan, spaced 6' x 16' (453 trees/acre) on M9 EMLA and 9' x 16' (302 trees/ac) on M26 EMLA. Each tree is supported by a post and the trees trained as central leader trees. Orchard management is carried out by the grower. Annual yields on a per tree basis are recorded by picking and weighing all apples from each tree. Annual circumference readings are taken on each tree 30 cm from the ground. These readings are converted to trunk cross section area (TCA). In 1989 a 50 apple sample was randomly collected from the picked apples for the three McIntosh strains and Spartans on both rootstocks. These apples were graded according to fruit diameter and percentage of solid red color. Yield data was not available for the 1990 crop due to a misunderstanding.

RESULTS AND DISCUSSION: The average yields per tree were higher in 1988 than in 1989 (Table 1). The decline in yields is consistent with other orchard plantings on the farm and is attributed to a heavy crop load in 1988 and climatic conditions. The highest average per tree yield in 1989 was 15.51 kg for Summerland/M26 EMLA and the lowest 7.88 kg for Spartan/M9 EMLA. These represent per acre yields of 246 bu and 188 bu based upon tree spacings used for the orchard. The highest per acre yield for 1989 was 311 bu for Summerland/M9 EMLA which compares to the 1988 high of 398 bu for Summerland/M26 EMLA. The per acre production of the M9 EMLA in the trial is misleading as the same spacing between rows (16') has been used for both rootstocks. A 6' x 13' for M9 EMLA would correspond with the 9' x 16' for M26 EMLA and this would result in 120 per cent increase in tree numbers and production on a per acre basis for those trees on M9 EMLA. Yields for these three McIntosh strains have been higher than Spartan.

The TCA for trees on M26 EMLA are larger than those on M9 EMLA (Table 2). The largest TCA 21.67 cm2 was recorded for Summerland/ M26 EMLA and smallest 6.88 cm2 for Spartan/M9 EMLA. The rootstock M26 EMLA is a more vigorous rootstock than M9 EMLA and this would account for the larger TCA. The highest yield efficiency was recorded for Marshall/M9 EMLA and the lowest for Marshall/M26 EMLA.

The Marshall McIntosh strain had the highest percentage of fruit with more than 85 per cent solid red color of the 3 strains under evaluation (Table 3). Marshall McIntosh has been reported as a highly colored strain of McIntosh. The cultivar Spartan was more highly colored than any of the 3 McIntosh strains. Fruit size for the three McIntosh was similar in 1989 (Table 4). The cultivar Spartan on M26 EMLA had the highest percentage of fruit >2 3/4 inches in diameter.

After 7 years of growth McIntosh production on M9 EMLA has been satisfactory. Over production in the third and fourth year of tree growth did have a negative effect on the growth of the trees on M9 EMLA but the grower was able to overcome some of these problems through pruning. Nectria and Gloeosporium canker has resulted in tree losses and reduced production. Canker is more of a concern than productivity of either rootstock and there is some concern about the use of these rootstocks because their lack of vigor appears to make them more prone to canker than trees on more vigorous rootstocks. Performance of M9 EMLA has resulted in the grower setting out a larger orchard planting of M9 EMLA in 1990.

Table 1: Average and Accumulated Yields per Tree of Three McIntosh Strains and Spartan on M9 EMLA and M26 EMLA.

	Average wt/tree		
Cultivar/Rootstock	1988 (kg)	1989 (kg)	Acc. 1986–89 (kg)
Marshall			
M9 EMLA	12.98	8.84	33.41
M26 EMLA	15.57	13.76	40.39
Summerland			
M9 EMLA	16.05	13.07	41.22
M26 EMLA	25.05	15.51	52.79
Blackmac			
M9 EMLA	12.39	9.19	30.17
M26 EMLA	16.48	14.59	40.79
Spartan			
M9 EMLA	7.44	7.88	20.98
M26 EMLA	15.16	10.86	33.41

Table 2: TCA and Cropping Efficiency of 3 McIntosh Strains and Spartan on M9 EMLA and M26 EMLA.

Cultivar/Rootstock	1989 TCA (cm^2)	Yield Efficiency (kg/cm^2)
Marshall		
M9 EMLA	11.08	3.02
M26 EMLA	21.04	1.91
Summerland		
M9 EMLA	14.08	2.92
M26 EMLA	21.67	2.44
Blackmac		
M9 EMLA	11.08	2.72
M26 EMLA	16.05	2.54
Spartan		
M9 EMLA	6.88	2.66
M26 EMLA	12.63	2.64

Table 3: Comparison of percent red color of 3 McIntosh strains and Spartan on M9 EMLA and M26 EMLA

Cultivar/Rootstock	<15 %	<55 %	55–65 %	66-75 %	76-85 %	86-95 %	>95 %
Marshall							
M9 EMLA	0	10	14	14	16	32	14
M26 EMLA	0	2	8	4	16	44	26
Summerland							
M9 EMLA	0	34	36	22	2	6	0
M26 EMLA	0	17	23	15	23	20	4
Blackmac							
M9 EMLA	0	28	26	20	10	14	2
M26 EMLA	0	6	30	28	19	17	0
Spartan							
M9 EMLA	0	0	6	4	16	30	44
M26 EMLA	0	0	4	4	16	34	40

Table 4: Comparison of fruit size for 3 McIntosh strains and Spartan on M9 EMLA and M26 EMLA

Cultivar/Rootstock	< 2 1/4 %	2 1/4 – 2 1/2 %	2 1/2 – 2 3/4 %	> 2 3/4 %
Marshall				
M9 EMLA	0	0	30.0	70.0
M26 EMLA	0	6.0	10.0	84.0
Summerland				
M9 EMLA	0	0	14.0	86.0
M26 EMLA	0	1.9	24.5	73.6
Blackmac				
M9 EMLA	0	0	10.0	90.0
M26 EMLA	0	2.1	10.6	87.3
Spartan				
M9 EMLA	0	2.0	20.0	78.0
M26 EMLA	0	0	0	100.00

COMMERCIAL PERFORMANCE OF GLOSTER 69 ON DWARFING ROOTSTOCK

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Abstract

Average yield per tree of Gloster 69 in a 3 year old commercial orchard planting was 13.4 kg for those trees on the rootstock M26 EMLA and 11.5 kg on M9 EMLA. Average fruit weight was 159 grams on M26 EMLA and 156 grams on M9 EMLA.

INTRODUCTION: Gloster 69, similar in appearance to Red Delicious, is a crisp, moderately juicy apple which originated in Germany from a cross between Weisser Winter Glockenayfel and Richared Delicious. This cultivar has gained commercial acceptance in Northern Europe and it may be suited to cooler areas of Eastern Canada were Red Delicious fruit size and yields are smaller than those obtained in the warmer growing regions of Canada. Earlier field trials indicate that Gloster 69 is more productive than Red Delicious and that the fruit develops good color in Nova Scotia and its quality in CA Storage is as good as or better than Red Delicious. Apples grown on the dwarf rootstocks obtain larger fruit size than those on other rootstocks.

MATERIALS AND METHODS: Two year old Gloster 69 trees with well developed branches were planted in a commercial orchard in 1988 on a coarse textured sandy loam in Canard, Kings County, N. S. The trees were planted at a spacing of 7' x 18', for a density of 352 trees per acre, on M9 EMLA and M26 EMLA rootstock alternating within the rows. Trees were supported by a bamboo pole attached to a single wire at a height of 7 feet. Limb bending was conducted by the orchard owner to promote good limb development and to induce fruit bud formation. The yield per tree was recorded from 45 trees on M9 EMLA and 69 trees on M26 EMLA. The total number of apples per tree and their weight was recorded for every 9th and 10th tree in the row. The trunk circumference per tree was recorded 30 cm from ground level following fruit harvesting.

RESULTS AND DISCUSSION: The average yield per tree for M9 EMLA was 11.5 kg while that of M26 EMLA was 13.4 kg (table 1). On a per acre basis the average yields would be 223 bu for M9 EMLA and 260 bu for M26 EMLA. The average fruit weight for M9 EMLA was 156 grams and 159 grams for M26 EMLA. These weights would represent an average fruit size of 2 3/4 inches in diameter or a 115 count apple. The TCA for M26 EMLA was 14.3 cm2 and 11.1 cm2 for M9 EMLA. The fruit load (fruit number/TCA) was 6.7 fruit/cm2 for M9 EMLA and 5.9 fruit/cm2 for M26 EMLA.

The early yields of Gloster are considered good for Nova Scotia and would surpass the production of other 3 year old plantings on EM26 planted previously on this farm. The well developed limbs at time of planting are critical for early and high production. Gloster has an upright growth habit and limb bending was beneficial in promoting earlier production. Gloster trees in this planting that didn't undergo limb bending appeared to have light crop loads.

It is unfortunate that such a wide spacing between rows was used by the grower. The inrow tree spacing would only warrant 13' to 15' between rows and not 18' as used. Reducing the between row spacing to 13' would have resulted in a 130 percent increase in production.

The fruit size that was obtained would be considered good for Nova Scotia, especially taking into consideration the crop load. The age of the trees and rootstock are contributing factors to the large fruit size and it will be of interest to see if this fruit size can be maintained as tree age increases. The Gloster were harvested on October 17 and were difficult to remove from the trees because of a strong petiole attachment to the fruit spur.

Table 1: Yield and Cropping Efficiency of Gloster on M9 EMLA and M26 EMLA

Rootstock	Yield/Tree (kg)	Bu/Ac	Avg. Fruit Wt. (g)	TCA cm2	Fruit/cm2
M26 EMLA	13.4	260	159	14.3	5.9
M9 EMLA	11.5	223	156	11.1	6.7

ORCHARD SYSTEMS TRIAL

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Abstract

Four training systems, Tatura V Trellis, Vertical Axis, High Density and 155 System, are being compared in a three acre planting of Idared and McIntosh apple trees. Establishment costs per acre for each system were Tatura V Trellis - $8,221.51, Vertical Axis - $6,857.78, High Density - $2,691.55 and 155 System - $991.88. After the first four years of cropping the Vertical Axis has the highest accumulated yield - 1051 bu/ac, followed by High Density - 611 bu/ac, Tatura V Trellis - 553 bu/ac and 155 System - 245 bu/ac.

INTRODUCTION: The AHC publication 1216, 155 System, explains the merits of this medium density system of 155 trees per acre over that of higher and lower density orchards. Some of the main advantages over high density orchards are the lower establishment costs, ease of management and tree support is not required. The 155 System utilizes a 14 foot tree which still means that picking ladders or stepladders will be required at harvest and may also be required during pruning. Trees in this system will also be slower to come into production and to reach maximum production than those in the high density system. It does not lend itself to rapid change when in the future orchard renewal may occur every 15 to 20 years. In recent years there has been a concern about the lack of harvest labour and it is felt that harvest labour will be more readily available for small trees in the high density orchard system. In order to take advantage of new apple cultivars high density systems are more advantagous than low or medium density systems.

In recent years a number of high density orchard systems, Tatura V Trellis, Ebro Trellis, Lincoln Canopy, Vertical Axis, etc. have been introduced to North American producers. There is only preliminary information on the performance of these systems under North American growing conditions. Doug Nichols, an apple producer, expressed an interest in high density systems and a project was jointly designed to compare 3 high density systems of particular interest to Doug with the 155 system. Funding for the project was obtained through AFDA I Technology Development Program.

MATERIALS AND METHODS: A three acre site was prepared in 1984 for planting and one-year old McIntosh and Idared trees were planted in the spring of 1985 with a mechanical tree planter. The trees were set out to four randomized training systems which were replicated twice in the planting. Three rows consisting of half McIntosh and Idared trees represented a replication. Trees trained to the 155 system were spaced 14' x 20' for a density of 155 trees per acre. The rootstock used was MM111 and the trees are free standing. The trees are trained to the central leader format. A total of 63 McIntosh and 63 Idared trees were planted in the 155 system. The tree spacing for the High Density System was 7' x 15' which allows for a tree density of 415 trees per acre. A total of 123 McIntosh and 126 Idared trees on the rootstock EM26 were planted to this system. The trees are free standing and being trained to the central leader format. The tree spacing for the Vertical Axis system is 5' x 15' for a density of 580 trees per acre. A total of 174 McIntosh and 159 Idared trees on the rootstock EM26 were planted to this system. The trees are supported by a single wire trellis and 10' rebar rods. The single wire is attached to 16' x 5' cedar posts 9' from the ground with the posts spaced 30' apart in the row. The 10' rebar rods were placed by each tree and attached to the wire. The trees were tied to the rebar rod with plastic tubing. The trees are trained to the Lespinasse format. The tree spacing for the Tatura V Trellis is 5' x 16' which allows for a density of 544 trees per acre. A total of 174 McIntosh and 165 Idared trees on the rootstock MM111 were planted to this system. The trees are supported by a V trellis consisting of 11 gauge wire attached to 16' x 5" cedar post positioned at a 60° angle and spaced 40' apart in the row. The trees are trained to the V trellis format.

Yield records are recorded annually. The total weight per cultivar and row is recorded. The average weight per tree is calculated by dividing the weight per row by tree number per row. The yield per acre is determined by multiplying the average weight per tree by the tree density. Girth measurements were measured in 1988 and 1989 at 30 cm from the soil surface for each tree.

RESULTS AND DISCUSSION: The highest orchard establishment cost occurred for the Tatura V Trellis at$8,221.51 per acre followed by the Vertical Axis - $6,857.78, High Density -$2,691.55 and 155 System -$991.98 per acre. The requirement of a support system for the Tatura V Trellis and Vertical Axis significantly increased the establishment cost. In terms of orchard management the same pattern has occurred with Tatura Trellis requiring 30 hrs of pruning and training time in 1988 followed by Vertical Axis - 11 hrs, High Density - 7.5 hrs and 155 System - 3.5 hrs.

The first yields were recorded in 1987 with Idared apples being harvested from all four systems while McIntosh apples were only harvested from the Vertical Axis and High Density plots (Tables 3 and 4). In 1987 the highest yields per acre occurred for the Vertical Axis plots followed by the High Density. In 1990 the Vertical Axis plots have continued to produce the greatest volume of fruit on a per acre basis for both cultivars. Up until 1990 the Tatura V Trellis has tended to produce the least fruit, however, in 1990 it was the second most productive system. The lowest yields occurred for the High Density Idared plots and the 155 System McIntosh plots. After four years of cropping the highest accumulated yields have been recorded for the Vertical Axis system (Table 5) while the lowest have occurred for the 155 System.

Comparing yields on a per tree basis, the highest yields in 1990 were recorded for the 155 System while those in the High Density System produced the least (Tables 1 and 2). After four years of cropping the highest accumulated yield has occurred for the 155 System while those in the Tatura V Trellis the least. Comparing tree size (TCA) the largest TCA in 1989 was recorded for those trees in the 155 System and the smallest for Vertical Axis Idared and High Density McIntosh (Table 6). The TCA for the Tatura V Trellis is misleading as the TCA is calculated from one of the two main shoots in cases where there is not a main trunk at 30 cm from ground level.

Although trees in the High Density and Vertical Axis systems are both on EM26 rootstock, those trees in the Vertical Axis have tended to be more productive. While minimal pruning for the Vertical Axis System has allowed the trees to fill their space more rapidly, those trees in the High Density have been headed back annually to promote a stronger central leader. Crop load has in some cases bent the central leader over on the unsupported trees, thereby reducing tree growth. There has also been some tree leaning of the unsupported trees which in turn has reduced vegetative growth.

In the Tatura V Trellis fruit production has been low prior to 1989 because of a lack of grower experience in developing trees in this system and because vegetative growth is much slower in Nova Scotia than in New Zealand where the system was developed. In 1990 the trees have filled more than three quarters of their alloted space and productivity has increased signficantly. However, the financial feasibility of this system has been jeopardized by the failure to obtain early and high yields.

The Vertical Axis system has produced early and high yields, however, the financial viability of this system is still questionable with fresh fruit prices being received by Nova Scotia producers. Additional yield records will be obtained to fully analyze the financial viability of the four planting systems.

Table 1: Average yield per tree for Idared trees grown under four different management systems.

	1987 kg/tree	1988 kg/tree	1989 kg/tree	1990 kg/tree
155	0.40	7.96	9.93	28.57
High Density	1.79	6.50	7.86	8.77
Vertical Axis	1.28	6.85	8.18	9.44
Tatura V	0.09	0.10	5.71	9.81

Table 2: Average yield per tree for McIntosh trees grown under four different management systems.

	1987 kg/tree	1988 kg/tree	1989 kg/tree	1990 kg/tree
155	0	1.76	6.09	20.68
High Density	0.06	5.33	5.83	15.78
Vertical Axis	0.23	7.37	8.64	17.21
Tatura V	0	0.27	3.19	15.78

Table 3: Yield per acre for Idared grown under four different management systems.

	1987 bu/ac	1988 bu/ac	1989 bu/ac	1990 bu/ac
155	3.18	65.43	81.49	233.07
High Density	37.57	141.32	171.24	191.56
Vertical Axis	38.15	210.94	251.84	288.17
Tatura V	2.29	71.58	161.48	280.86

Table 4: Yield per acre for McIntosh grown under four different management systems.

	1987 bu/ac	1988 bu/ac	1989 bu/ac	1990 bu/ac
155	0	27.24	49.19	168.70
High Density	1.09	137.39	127.99	344.67
Vertical Axis	7.02	256.12	262.52	525.36
Tatura V	0	8.59	92.76	451.81

Table 5: Accumulated yields (1985-1990) of Idared and McIntosh grown under four different management systems.

	Idared		McIntosh	
	kg/tree	bu/ac	kg/tree	bu/ac
155	46.86	383.17	28.53	245.13
High Density	24.92	541.69	27.00	611.14
Vertical Axis	25.75	789.10	33.45	1051.02
Tatura V	15.71	516.31	19.24	553.16

Table 6: 1989 average cross sectional area of Idared and McIntosh grown under four management systems.

	TCA (cm2)	
	Idared	McIntosh
155	27.24	25.21
High Density	13.24	15.16
Vertical Axis	12.24	16.50
Tatura V	17.67	16.96

YIELD, PACKOUT AND ACCEPTABILITY COMPARISON FOR 11 SCAB RESISTANT CULTIVARS

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Abstract

Eleven scab resistant apple cultivars are being evaluated as to their acceptability for commercial apple production. To date Moira has been the most productive and Sir Prize the least. In 1990 upwards of 55 per cent of the fruit was infected with Sooty Blotch and Fly Speck and 19.0 per cent was damaged by insects. Waxul calcium reduced the incidence of Bitter Pit in the apples. A preliminary evaluation of the acceptability of scab resistant cultivars indicates that Redfree, Moira and Novamac received the most favourable responses.

PART A

INTRODUCTION: A one third acre planting of 11 apple scab resistant cultivars consisting of four trees per cultivar was planted in 1982 to 1983. The orchard was established to obtain information on the suitability of these cultivars for commercial apple production and on the production of apples with reduced pesticide usage.

Since the 1989 Alar scare there has been more public attention given to the use of pesticides on food. In 1990 the safety of the EBDC group of fungicides became an issue in the USA and these products were withdrawn from the marketplace while the products undergo a pesticide review. In Nova Scotia apple producers would be hard pressed to grow the common apple cultivars without the use of fungicides. Our wet climatic conditions are well suited for the spread of the apple fungus known as apple scab and in most years 10 to 12 fungicide applications are made to control this diease. The removal of chemically manufactured fungicides would eliminate much of Nova Scotia's commercial apple production.

Scab resistant cultivars began to be named and released in the 1970's and in recent years the naming and releasing of new scab resistant cultivars has been increasing. As most of these new cultivars have been developed outside of Nova Scotia cultural information on the performance of these cultivars under Nova Scotia growing conditions is required so that recommendations can be made on cultivar selections.

Bitter Pit, a calcium deficiency disorder, can be a problem on the fruit and some of the scab resistant cultivars are more prone to this disorder. Spray applications of calcium during the growing season can reduce the incidence of this disorder. Several commercial nutrient sprays containing calcium have been introduced to the marketplace in hopes of replacing calcium choride sprays. Wuxal calcium was recently introduced to Nova Scotia apple producers as a calcium spray with trace elements for reducing calcium-related physiological disorders.

MATERIALS AND METHODS: Two trees each of the 11 cultivars were treated with Wuxal calcium during the 1990 growing season. Wuxal calcium containing 10% N, 10.72% Ca, 1.2% Mg, 0.05% B, 0.005% Co, 0.05% Cu, 0.1% Fe, 0.05% Mn, 0.0005% Mo, and 0.05% Zn was applied with a handgun sprayer at two week intervals beginning on June 12. A total of 5 applications at a rate of 136.4 ml/18 gal (5.5 L/ha) were made.

A chemical thinning treatment of 15 ppm NAA was applied to those trees with an overset of fruit on June 20. Fruit size ranged between 11.3 and 14.8 mm in diameter when the thinner was applied. One insecticide application of Malathion 25WP at a rate of 2 kg/ha was applied on June 14 to control stinging bugs. An application of Reglone 56 mL/gal to control weed growth was applied on July 11.

All apples per tree were harvested and weighed in the fall. All fruit was placed in cold storage following harvest. Following harvest trunk circumference readings were taken 30 cm from ground level on all trees. In November, 50 apple samples from the cultivars Britegold, Macfree, Moira, Prima, Redfree, Sir Prize and Trent were assessed for disease and insect damage and the incidence of bitter pit.

RESULTS AND DISCUSSION: In 1990 the highest yield per tree (Table 1) was recorded for Trent 44.95 kg/tree and Prima 41.25 kg/tree while Sir Prize produced the least 5.68 kg/tree. The per tree yield for Trent would represent an acre production of 367 bushels. The accumulated yield per tree in 1985–90 is highest for Prima 125.1 kg/tree and lowest for Sir Prize 10.54 kg/tree. Trunk size recordings for 1990 (Table 2) show that Prima are the largest trees while Britegold are the smallest. In terms of yield efficiency, Moira at 2.33 kg/cm2 has been the most efficient and Sir Prize the least. Novamac, which is felt to produce fruit suitable for commercial sales, had the second lowest yield efficiency 0.99 kg/cm^2.

Fruit commitment for a storage study and a taste panel study resulted in only 7 of the 11 cultivars having apples for a grade-out, insect and disease damage and bitter pit analysis. Of the 7 cultivars graded according to fruit size, the cultivar Trent had the highest percentage (61.40) of fruit in the large category (> 2 3/4 inches) (Table 3) while Britegold had the smallest 1.65%. In the cull category (<2 1/4 inches) Britegold had the highest percentage 26.95 while Trent had the lowest percentage 0.55. The cultivars Prima, Redfree, Sir Prize and Trent had the highest percentage of their fruit in the medium to large categories while Macfree and Moira had the highest percentage in the small to medium categories and Britegold in the small to medium cull categories.

Secondary fungal diseases such as Sooty Blotch and Fly Speck are usually controlled in commercial orchards through the use of fungicide applications for apple scab. The elimination of fungicide applications for apple scab can result in the development of secondary fungal disease. Although Sooty Blotch and Fly Speck do little or no actual damage to the fruit, their presence on the fruit surface lowers the quality of the apple. Of the 7 cultivars evaluated for the presence of these two fungi (Table 4) Redfree was the only cultivar that they were not observed on. Moira, Macfree and Trent had approximately 40 percent or more of the fruit with one or both of the fungi present.

The orchard was monitored for insect activity and only one insecticide application was made during the growing season. Examination of the 50 apple samples revealed that upwards of 19 per cent of the apples were damaged by insect activity (Table 4). The highest percentage of damage was primarily due to codling moth with the exception of Prima where apple maggot damage was slightly greater than that of codling moth.

Bitter pit was observed on 5 of the 7 cultivars (Table 5) evaluated with Prima and Trent having the highest percentage of fruit with bitter pit. With the exception of Britegold those fruit treated with the Wuxal calcium sprays had a lower percentage of fruit with bitter pit then the untreated fruit. Additional information from a storage study many provide data on the effect of Wuxal on fruit firmness and storage disorders. This data will not be available until the spring of 1991.

To date the small collection of scab resistant cultivars has revealed that Prima, Redfree, Moira and Novamac have more promise for commerical apple production then the other 7 cultivars. There is some concern about the cropping efficiency of Novamac. As fungicides are eliminated for scab control growers will either have to live with secondary disease such as Sooty Blotch and Fly Speck or find a satisfactory means of control. This planting allows us to observe and develop techniques for reduced pesticide usage and find satisfactory means of reducing the fruit damage.

Table 1: Average yield per tree for eleven scab resistant cultivars

	1988 kg/tree	1989 kg/tree	1990 kg/tree	Cumulated 85-90 kg/tree
Prima	18.33	38.55	41.25	125.10
Priscilla	4.90	21.33	13.20	57.61
Sir Prize	2.28	1.98	5.68	10.54
Jonafree	19.00	13.30	35.40	81.22
Redfree	17.80	4.57	27.26	62.95
Britegold	21.50	2.00	27.15	59.32
Macfree	26.25	6.53	27.25	78.01
Moira	25.83	28.30	37.86	115.89
Trent	15.88	33.05	44.95	122.86
Nova Easygro	45.15	8.60	18.90	73.95
Novamac	14.38	0.05	21.86	43.66

Table 2: Trunk size and cropping efficiency of 11 scab resistant cultivars on EM 7A rootstock

Cultivar	Trunk Size 1990 (cm^2)	Yield Efficiency (kg/cm^2)
Prima	80.98	1.55
Priscilla	43.95	1.31
Sir Prize	42.46	0.25
Jonafree	52.15	1.56
Redfree	45.84	1.37
Britegold	39.57	1.50
Macfree	55.46	1.41
Moira	49.74	2.33
Trent	71.14	1.72
Nova Easygro	45.46	1.63
Novamac	43.95	0.99

Table 3: Grade-out of 7 scab resistant cultivars

	< 2 1/4 %	2 1/4 – 2 1/2 %	2 1/2 – 2 3/4 %	>2 3/4 %
Britegold	26.95	56.60	14.75	1.65
Macfree	10.70	57.30	30.10	2.00
Moira	12.75	44.65	37.60	4.95
Prima	1.70	24.20	39.40	34.80
Redfree	6.40	19.20	27.30	47.10
Sir Prize	1.40	23.10	52.20	23.30
Trent	0.55	5.95	32.10	61.40

Table 4: Percentage of fruit with Fly Speck, Sooty Mold and Insect Injury

Cultivar	Sooty Blotch Fly Speck %	Insect Damage %
Britegold	28.1	13.1
Macfree	43.5	7.0
Moira	55.0	9.0
Prima	6.0	19.0
Redfree	0.0	14.0
Sir Prize	18.2	3.2
Trent	49.0	10.0

Table 5: Response of 7 scab resistant cultivars to 5 foliar applications of Wuxal Calcium

	Per cent Bitter Pit	
	Non-Treated	Wuxal Treated
Britegold	2.0	2.0
Macfree	0	0
Moira	0	0
Prima	18.0	4.0
Redfree	4.0	2.0
Sir Prize	10.0	4.5
Trent	18.0	10.0

PART B

INTRODUCTION: A preliminary evaluation of the acceptability of selected scab resistant apple cultivars was conducted at the Kentville Research Centre during October and November, 1990. The purpose of the testing was to achieve an indication of the degree of liking for the appearance, colour, flavour and texture of scab resistant cultivars grown at the provincial test plot in Woodville, NS.

MATERIALS AND METHODS: Since not all samples could be harvested or tested at the same time, cultivars were grouped for comparison within the season. The scab resistant cultivars Redfree, Prima and Britegold were evaluated first, the cultivars Moira, Sir Prize and Novamac were assessed at the second taste panel session and the cultivars Nova Easygro, Macfree, Priscilla and Trent at the third session. Thus, three separate taste panel sessions were required to evaluate all the cultivars. Panelists were also asked to evaluate a standard reference cultivar at each session. McIntosh apples were used as the reference for the first and second sessions and Cortland was presented during the third session. Like the scab resistant cultivars, these reference samples were identified to the panelists only by a 3-digit code.

Eighteen hours before each taste panel session, apples were removed from storage and allowed to warm to room temperature (20+2°C). The apples were washed, dried and tagged with 3-digit random number codes. For each cultivar tested, each panelist was presented with a whole apple. The serving order was randomized for each panelist.

Each panelist was asked to evaluate each coded sample (cultivar) for degree of liking of appearance, colour, flavour and texture on 9-point hedonic scales (1=dislike extremely; 9=like extremely) and overall acceptability on a 9-point scale (1=extremely unacceptable; 9=acceptable). An example of the ballot is presented in Appendix A.

All the testing was conducted in a 7-booth, climate controlled sensory evaluation facility located at the Kentville Research Centre. White incandescent lights illuminated the test area. Room temperature distilled water and unsalted crackers were presented to the panelists so they could rinse their mouths before and between samples.

The data were analysed using Genstat 5 (Rothamsted, Hertfordshire) with an analysis of variance conducted for each grouping of cultivars (each session) on each of the 5 characteristics rated by the consumer panel. The standard error of the mean (SEM) was calculated to provide a comparison of the mean values for cultivars.

RESULTS AND DISCUSSION: Overall, for the cultivars McIntosh, Redfree, Prima and Britegold, the scab resistant cultivar Redfree was well accepted by the taste panelists with high scores for colour, appearance, flavour, texture and overall acceptability (Table). Indeed, the colour and appearance of Redfree was judged to be as acceptable as that of McIntosh. The mean scores for Redfree would indicate that on average, the colour and appearance of this cultivar was rated between 'like moderately' and 'like very much'. Redfree also received a higher score than Prima and Britegold for degree of liking of flavour. No statistically significant difference ($p>0.05$) was found among the three scab resistant cultivars for degree of liking of texture.

At the second session during which the cultivars McIntosh, Moira, Sir Prize and Novamac were evaluated, the scab resistant cultivars Moira and Novamac were both well liked, however, for different reasons (Table). Moira scored second high for appearance while Novamac received high ratings for flavour. For texture and colour both cultivars received similar and reasonably high scores. In comparison with McIntosh, Moira received as high a score as McIntosh for appearance, Novamac was rated equivalent to McIntosh for colour and texture. The other cultivar included in this group, Sir Prize, did not fare as well. The mean scores for Sir Prize indicated that while, on average, the panelists liked the texture of this cultivar, its appearance, colour and flavour were less appealing.

At the third session the scab resistant cultivars Nova Easygro, Macfree, Priscilla and Trent were assessed along with the standard cultivar Cortland (Table). Interestingly, the appearance of all these scab resistant cultivars was liked as much as the appearance of Cortland. For colour, the cultivar Priscilla was significantly more liked than the other four cultivars. On average, the cultivars Cortland, Nova Easygro, Macfree, and Trent all received colour ratings of 'like slightly'. While Priscilla was well liked for colour, its flavour was found to be less pleasing as it received a mean score equivalent to the scale category 'neither like nor dislike'. Trent received much the same score for flavour. For this grouping of cultivars, Cortland certainly received the highest flavour score with Macfree and Nova Easygro the next best ratings for flavour. For degree of liking of texture, the texture of Macfree and Cortland were equally liked and their texture was more preferred to that of Nova Easygro, Priscilla and Trent.

Overall, the results of this preliminary study indicate that the scab resistant cultivars Redfree, Moira and Novamac received the most favourable responses from the 46 employees participating in the testing. These cultivars should now be submitted for additional consumer testing with a larger number of respondents and evaluations conducted at more than one harvest date. Information on the physical properties of these cultivars (e.g. soluble solids, pressure tests) collected at the same time may also provide valuable insights into the reasons consumers liked or disliked the characteristics of particular cultivars.

Table 6: Mean values for degree of liking of the appearance, colour, flavour and texture and overall acceptability of scab resistant apple cultivars.

Cultivar	Appearance	Colour	Flavour	Texture	Overall Acceptability
McIntosh	7.72	7.9	7.5	7.4	7.8
Redfree	7.2	7.4	6.6	6.5	6.8
Prima	6.5	6.2	5.9	5.9	6.0
Britegold	5.1	4.9	5.4	5.8	5.3
SEM (N=46, df=135)	0.213	0.23	0.24	0.26	0.22
Significant effects	***	***	***	***	***
McIntosh	7.7	7.8	7.2	6.6	7.3
Moira	7.4	7.5	6.4	6.9	6.5
Sir Prize	4.8	4.4	5.5	6.9	5.3
Novamac	6.4	7.6	7.3	6.7	7.0
SEM (n=46, df=135)	0.24	0.21	0.23	0.22	0.22
Significant effects	***	***	***	NS	***
Cortland	6.1	5.8	7.2	6.8	6.9
Nova Easygro	6.4	6.1	5.9	5.4	5.8
Macfree	6.2	6.1	6.1	6.6	6.1
Priscilla	6.5	7.0	4.8	4.7	4.7
Trent	6.3	6.2	5.3	4.4	5.3
SEM (n=46, df=135)	0.22	0.23	0.25	0.26	0.25
Significant effects					

1 Cultivars were assessed at 3 separate sessions.

2 Mean of 46 ratings. Each cultivar was evaluated for degree of liking of appearance, colour, flavour and texture on 1-9 scales (1=dislike extremely, 9=like extremely) and overall acceptability (1=extremely unacceptable, 9=extremely acceptable).

3 Means that differ by a value of greater than 3 times the SEM would be considered significantly different.

Appendex A:

Ballot used to rate the acceptability of scab resistant apple cultivars.

Product: Fresh Apples

Name ______________________________

Date ______________________________

1) Take sample number _____.

2) Look at the sample. On the scales printed below indicate how much you like or dislike the appearance and then how much you like or dislike the color of the sample. Place a check mark ( ) by the rating that best describes your feeling about the sample.

APPEARANCE	COLOUR
____ Like Extremely	____ Like Extremely
____ Like Very Much	____ Like Very Much
____ Like Moderately	____ Like Moderately
____ Like Slightly	____ Like Slightly
____ Neither Like or Dislike	____ Neither Like or Dislike
____ Dislike Slightly	____ Dislike Slightly
____ Dislike Moderately	____ Dislike Moderately
____ Dislike Very Much	____ Dislike Very Much
____ Dislike Extremely	____ Dislike Extremely

3) Please taste the apple. On the scales printed below indicate how much you like or dislike the flavour and then how much you like or dislike the texture of the sample. Place a check mark ( ) by the term that best describes your feeling about the sample.

FLAVOUR	TEXTURE
____ Like Extremely	____ Like Extremely
____ Like Very Much	____ Like Very Much
____ Like Moderately	____ Like Moderately
____ Like Slightly	____ Like Slightly
____ Neither Like or Dislike	____ Neither Like or Dislike
____ Dislike Slightly	____ Dislike Slightly
____ Dislike Moderately	____ Dislike Moderately
____ Dislike Very Much	____ Dislike Very Much
____ Dislike Extremely	____ Dislike Extremely

4) Overall, how acceptable or unacceptable would you say this sample is to you. Check ( ) your overall feeling about the sample.

____ Extremely Acceptable
____ Very Acceptable
____ Moderately Acceptable
____ Slightly Acceptable
____ Neither Acceptable or Unacceptable
____ Slightly Unacceptable
____ Moderately Unacceptable
____ Very Unacceptable
____ Extremely Unacceptable

5) Please take a bit of cracker and rinse your mouth by drinking some water.

6) Turn the page and start the next sample.

APPLE ROOTSTOCK, CULTIVARS AND TRAINING SYSTEMS EVALUATION

W.E. Craig, Horticulturist,
J. Arnold, Technician

RESEARCH NOTE

A four acre orchard planting consisting of four cultivars, Jonagold (Wilmuta strain), Elstar, McIntosh (Marshall strain), Golden Delicious (Smoothee strain) on two dwarfing rootstocks M9 EMLA and M26 EMLA rootstocks was set out in April 1990.

The trees will be trained to two systems, spindle bush or vertical axe. All cultivars on M9 EMLA were set out in rows with a spacing of 6' x 12' for a density of 605 trees/ac. All cultivars on M26 EMLA were set out in rows with a spacing of 8' x 14' for a density of 388 trees/ac. Plots will be established within this planting to compare production between rootstocks, training systems and cultivars. Two of the cultivars, Jonagold and Elstar, are newer cultivars that have become widely planted in Europe and show promise as being suited to our cooler climate. All cultural management will be carried out by the orchard owner Peter VanOostrum. Funding for the program was provided by the Canada/Nova Scotia Agri-Food Development Agreement under the Technology Introduction & Evaluation Program.

APPLE ROOTSTOCK EVALUATION TRIAL

W.E. Craig, Horticulturist
C. Embree, Research Scientist, *Agr. Canada*
J. Arnold, Technician
Nova Scotia Fruit Growers Association

RESEARCH NOTE

A tripartite apple rootstock trial involving the NSFGA Rootstock Committee, Agriculture Canada and the Nova Scotia Department of Agriculture and Marketing was initiated in 1988. The trial will compare the performance of the cultivar Macspur on eight apple rootstocks: MAC 1, M4, M7, M26, KSC-28, MM106, Bud-490 and self-rooted Macspur. The trees for the trial were propagated by Agriculture Canada in their nursery at the Kentville Research Station. Six grower sites were selected and trees were distributed to the growers in May, 1990. An additional planting site was located at the Kentville Research Station.

Each site was planted with 56 trees, consisting of 7 trees on each of the 8 rootstocks. The trees were set out in 7 randomized blocks at each site. Guard trees were planted at the beginning and end of each row. All trees were spaced 10 feet apart in the row and between row spacing when required was left to the discretion of the grower. All trees are free standing with the exception of those on EM26 which require a stake for tree support. The trees are to be trained by the growers to the central leader form. Annual growth and yield records will be kept for the 7 sites.

PEAR ROOTSTOCK EVALUATION TRIAL

W.E. Craig, Horticulturist
C. Embree, Research Scientist, *Agr. Canada*
J. Arnold, Technician
Nova Scotia Fruit Growers Association

RESEARCH NOTE

A tripartite pear rootstock trial was initiated in 1987 between the NSFGA Rootstock Committee, Agriculture Canada and the Nova Scotia Department of Agriculture and Marketing. The trial will evaluate the performance of three pear cultivars — Clapp's Favorite, Swiss Bartlett and Conference — on four size controlling pear rootstocks — Old Home X Farmingdale 69, 87, 333 and Quince A. These four rootstocks are presently not used in Nova Scotia pear plantings.

The trees for the trial were propagated by Agriculture Canada in their nursery at the Kentville Research Station. Four grower sites were selected plus a site at the Research Station for planting in 1990. Tree numbers restricted the ability to fully repeat the trial at each site. Two sites, Andrew Bishop and the Research Station, received the full complement of 84 trees. The trees were set out by cultivars with 7 replicates of 4 trees per cultivar. At the other three sites, growers only received 42 trees as only 2 rootstocks are compared at each site. Guard trees were planted at the beginning and end of each row. A record of tree survival, annual growth and production will be kept.

EASTERN CANADIAN DRY BEAN CO-OP TEST

Charles Thompson, Vegetable Specialist
Kim Best, Agricultural Technician

Abstract

Thirty six dry bean varieties were grown in 1990 in an Eastern Canadian trial, Kentville, Nova Scotia location, in conjunction with the Ontario Ministry of Agriculture and Food. Harvest was carried out in the fall of 1990 focusing on yield and quality data. Navy beans and pink beans showed the highest yields, while the light red kidney beans were the highest quality. A number of these varieties indicate commercial potential for production in Nova Scotia.

INTRODUCTION: An Eastern Canadian Dry Bean Co-op Test was co-ordinated by the Ontario Ministry of Agriculture and Food under the direction of Robert Forest, Centralia College of Agricultural Technology. The purpose of this trial was to gain information for the many Eastern Canadian growers interested in improving and increasing dry bean production.

MATERIALS AND METHODS: Thirty six varieties of dry beans were planted June 12, 1990. The trial was made up of a number of bean types including: navy, cranberry, kidney, yellow eye, heirloom, pink, pinto and small red beans. Two strain crosses were also included. Each variety was replicated four times within the trial. Each replication, known as a plot, consisted of two 3 meter rows spaced 76 cm apart. Spacing within the row was 5 cm.

The fertilizer application consisted of 336 kg/ha of 12-24-24 banded 4 weeks after seeding. At harvest, each row was trimmed to 2.46 m. Thus, yields for each variety were recorded for a total of 4.9 m. All plots were hand harvested and mechanically threshed and cleaned.

RESULTS AND DISCUSSION: Although the season was very dry and irrigation was unavailable, yields were good and quality was excellent. The pink and navy beans produced the highest yields, over 4600 kg/ha, on average. All yields were over 2000 kg/ha. Yields are recorded at 18% moisture on request of Robert Forest, Project Leader. This may cause the yields to appear somewhat high, however, the figures compare to past dry bean trials carried out in Nova Scotia.

Table 1 refers to both 1989 and 1990 yields, where applicable, as this trial was carried out for two years. Visual seed ratings are included for both years as well. The light red kidney beans showed the highest quality in 1990. The "actual" yield referred to in Table 1, lists the yields before conversion to 18% moisture. Harvested beans averaged 9.5% moisture.

CONCLUSION: The results of this trial have been discussed with growers and presented at the 1990 Annual Meeting of the Nova Scotia Vegetable and Potato Producers Association. There continues to be a growing interest in the prospect of increasing and improving dry bean production in Nova Scotia. This trial shows that many varieties and types of beans can be grown in our climate, producing good yields and excellent quality. This trial will be continued looking at promising varieties, as well as new entries.

Table 1: EASTERN CANADIAN DRY BEAN CO-OP TRIAL 1989 & 1990.

	Variety	Yield kg/ha (actual)	Yield kg/ha adj. to 18% moist. 1990	Yield kg/ha Adj. to 18% moist. 1989	1990 Seed Rating	1989 Seed Rating
1.	Seaforth	1859	3441	2273	2	3
2.	Sprint	2555	5587	2833	3.5	3.5
3.	Cygnus	2307	4478	3400	2	3
4.	Gryphon	2188	4240	4333	1.5	2.5
5.	Midland	2322	4495	3333	2	3
6.	Rocket	2535	4685	2667	3	3
7.	Wesland	2514	4666	2867	2.5	2.5
8.	Stinger	2861	5173	4333	1	3
9.	Mitchell	2527	4572	3133	2.5	3
10.	Centralia	2645	5171	3933	1.5	3
11.	Harokent	2672	5081	3067	2	3
12.	Dresden	2755	5117	3200	3	2
13.	Schooner	2986	5293	N/A	2	N/A
14.	Taylor Hort	2466	4569	3400	2	2
15.	SVM Cran	2048	3853	N/A	2	N/A
16.	IG6604	2102	3903	2667	2	3
17.	Guardian	2631	4883	N/A	1	N/A
18.	Larger Soldier	2149	3991	N/A	1.5	N/A
19.	ISB 865	2694	4897	2600	1	3
20.	Sacramento	2254	3855	2400	1	3
21.	J.C.#1 Webster	1913	3451	N/A	3	N/A
22.	SVM 29-21	2611	4888	N/A	1	N/A
23.	SVM 31-19	2466	4485	N/A	1	N/A
24.	SVM 37-16	2619	4626	N/A	1	N/A
25.	SVM 40-23	2147	3989	N/A	1	N/A
26.	J.C.#2 Webster	2029	3845	N/A	3	N/A
27.	Arestuben	1587	2972	2800	2	2
28.	Kenearly	2188	4423	N/A	1.5	N/A
29.	Maine Yell.Eye	1212	2246	3333	2	3
30.	Soldier	1985	3586	N/A	1	N/A
31.	Jacob's Cattle	2227	4069	2000	3	4
32.	NS-N-1	1523	2835	3400	2	3
33.	RB85312	2787	4890	3667	1.5	3
34.	J.C.xSoldier	2187	4343	N/A	2	N/A
35.	Agassiz	2464	4668	N/A	2	N/A
36.	Ember	2891	4657	N/A	3	N/A
37.	NS-N-1-88	1220	2033	N/A	2	N/A
38.	NS-N-1-9-89	1713	3211	N/A	2	N/A
39.	Kenearly #1	1935	3483	N/A	1	N/A
40.	Kenearly #2	1603	2885	N/A	1	N/A
41.	Small Soldier	1975	3292	N/A	1	N/A

Note: To calculate yield in lbs/acre multiply kg/ha by 0.89

Seed Ratings: 1=excellent; 2=very good; 3=good; 4=fair; 5=poor

This is a visual rating. Varieties #18, 21, 26 and 34 are replacements secured by C. N. Thompson.

CULTIVAR PROJECT '90

Charles Thompson, Vegetable Specialist
Kim Best, Agricultural Technician

Abstract

Forty-four growers participated in this Advanced Cultivar Adaptation Project funded through the Nova Scotia Vegetable and Potato Producers Association under the Agri-Food Development Agreement. Information included in the project report, AFDA Technology Introduction/Evaluation TIP-12-1990 Advanced Cultivar Adaptation Trials, was provided by these growers and from joint trials of the Nova Scotia Vegetable and Potato Producers Association and the Nova Scotia Department of Agriculture and Marketing. In 1990, 302 cultivars of 22 vegetables were tested within this project.

Nova Scotia Vegetable and Potato Producers Association and Nova Scotia Department of Agriculture & Marketing crops were grown in two separate fields. One at the Kentville Research Station consisted mainly of cucumbers and cole crops. The second trial was on the farm of Charles Keddy, Lakeville, focusing on squash, dry beans, tomatoes and a variety of melons. A few early crops were also grown in an unheated tunnel greenhouse consisting mainly of turnip, lettuce and cole crops. A copy of the complete report will be provided upon request.

CABBAGE TRIAL 1990

Charles Thompson, Vegetable Specialist
Kim Best, Agriculutural Technician

MATERIALS AND METHODS: Four replications of three cultivars of late cabbage for storage were planted on three scheduled planting dates. These were as follows:

Planting 1	June 12
Planting 2	July 5
Planting 3	July 27

Spacing was 12" x 36".

RESULTS AND DISCUSSION: Insect damage was severe in all three plantings. The third planting on July 27 did not size up into marketable heads, perhaps due to droughty conditions. No cabbage was stored due to insect damage and susceptability to disease.

Table 1: CABBAGE TRIAL RESULTS 1990

	1st Planting Measurements			2nd Planting Measurements		
Cultivar	Wt. (g)	Polar (cm)	Equator (cm)	Wt. (g)	Polar (cm)	Equator (cm)
Bartolo	1607	15.0	15.0	942	13.0	12.5
Lennox	2207	14.5	17.0	1235	13.5	13.5
April Green	1591	13.4	14.3	853	12.0	11.5

BLUEBERRY FIELD POLLINATOR COUNTS — 1990

Dick Rogers, Apiculturist/Tree Fruit Entomologist

INTRODUCTION: Wild pollinators are effective pollinators of blueberries. However, the insects that comprise the wild pollinator complex are subject to unpredictable, and often dramatic, population fluctuations in some years. There are many factors that contribute to this "rise and fall", and the factors can be quite different for each species.

An annual assessment of pollinator abundance is a useful way to determine if certain pollinator species are present in blueberry fields in sufficient numbers to achieve blueberry pollination. Therefore, two surveys were conducted in Nova Scotia, during the 1990 blueberry bloom period, to collect data that might contribute to our understanding of pollinator activity.

MATERIALS AND METHODS:

SURVEY 1

Dick Rogers and Rick Whitman visited three blueberry fields in Cumberland County on June 15, 1990 during peak bloom. One to two timed counts were done by each individual as follows. A random starting point was chosen in each field and an irregular transect was walked for five minutes. The pace was slow and observations on pollinator species and abundance were done within each five minute period.

SURVEY 2

Jack Sibley, Andrew King, et al surveyed three fields as follows:

1. Bridgeville, Pictou Co., June 19 and 25.
2. Allen Hill (Advocate), Cumberland Co., June 19, 25, 26, 27
3. Diligent River (Parrsboro), Cumberland Co., June 19, 25, 26, 27

Three plots were established in each field and 5 minute counts in each plot were done every hour for six hours on each date.

RESULTS AND DISCUSSION:

SURVEY 1 — The raw and summarized data are presented in Table 1. However, Figure 1 more clearly demonstrates that honeybees were the most abundant pollinator of this survey.

Table 1

Blueberry field pollinator counts - June 15, 1990
(Bee hives present at all locations)

Field	BB	HB	SB	Other	Start	T.Min.	Weather/Comments
Cliff Loy	2	39	6	2	12.10	20	Windy, Sunny, 25.5°C
Count/Min	0.1	2	0.3	0.1			total count/min = 2.45
McCormick	0	13	6	4	12.55	15	Windy, Sunny, 26.0°C
Count/Min	0	0.9	0.4	0.27			total count/min = 1.53
Crowe	2	27	4	0	15.00	15	Windy, Sunny, 26.0°C
Count/Min	0.13	1.8	0.3	0			total count/min = 2.20

BB = Blumblebees; HB = Honey bees; SB = Solitary bees

SURVEY 2

Figure 2 graphically presents the data collected from blueberry fields that had different hive densities.

CONCLUSIONS: The preliminary results of Survey 2 appear to suggest that in years when wild pollinators are abundant, adequate pollination may be achieved. However, it is known that wild pollinator abundance can be quite variable between fields and between years. Therefore, the presence of honey bee colonies should compensate in years when there is a dearth of wild pollinators. Survey 2 results also seem to demonstrate that a higher density of hives will result in a greater number of honey bees competing for the blueberry bloom. This competition may be why blueberry yields have been observed to be higher in fields with the greatest number of hives.

Figure 1. Blueberry field pollinator counts - June 15, 1990.

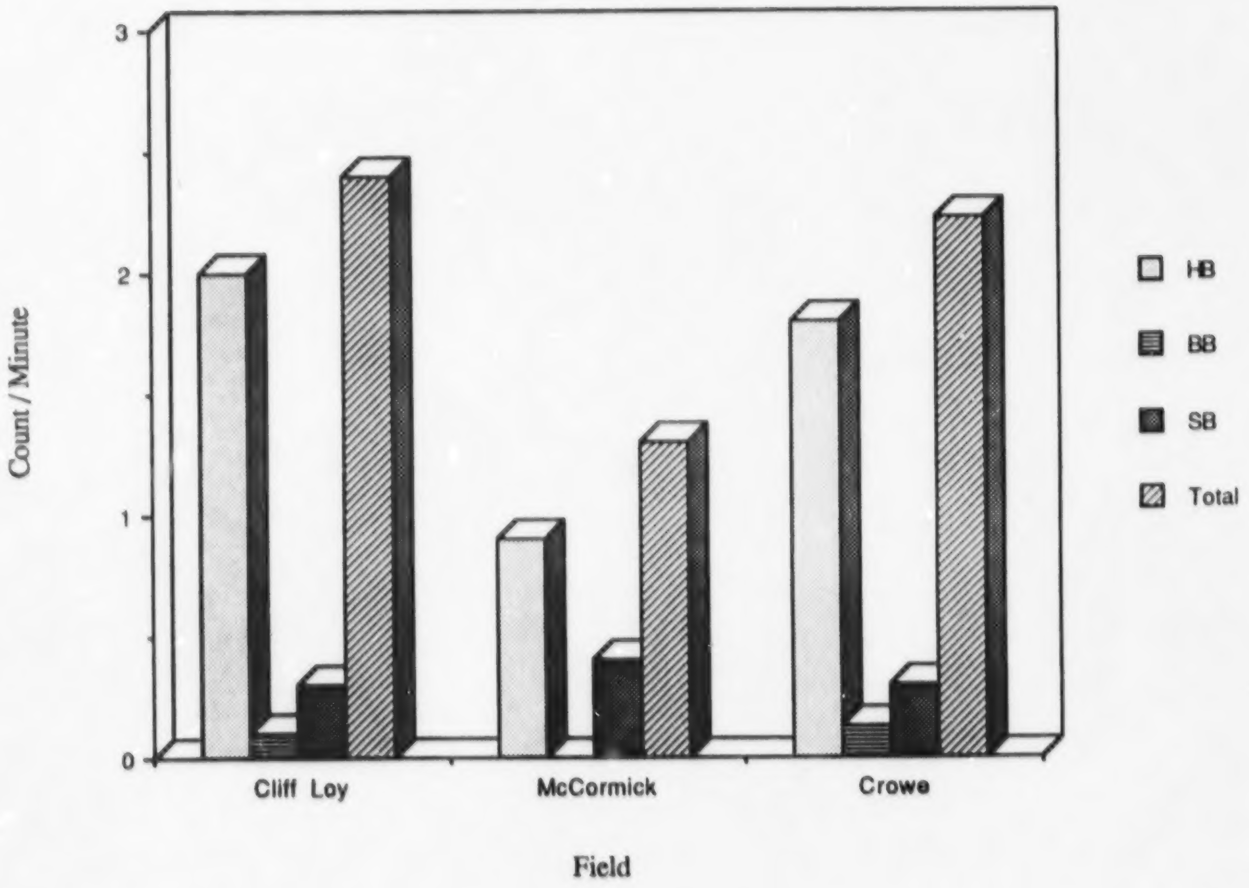
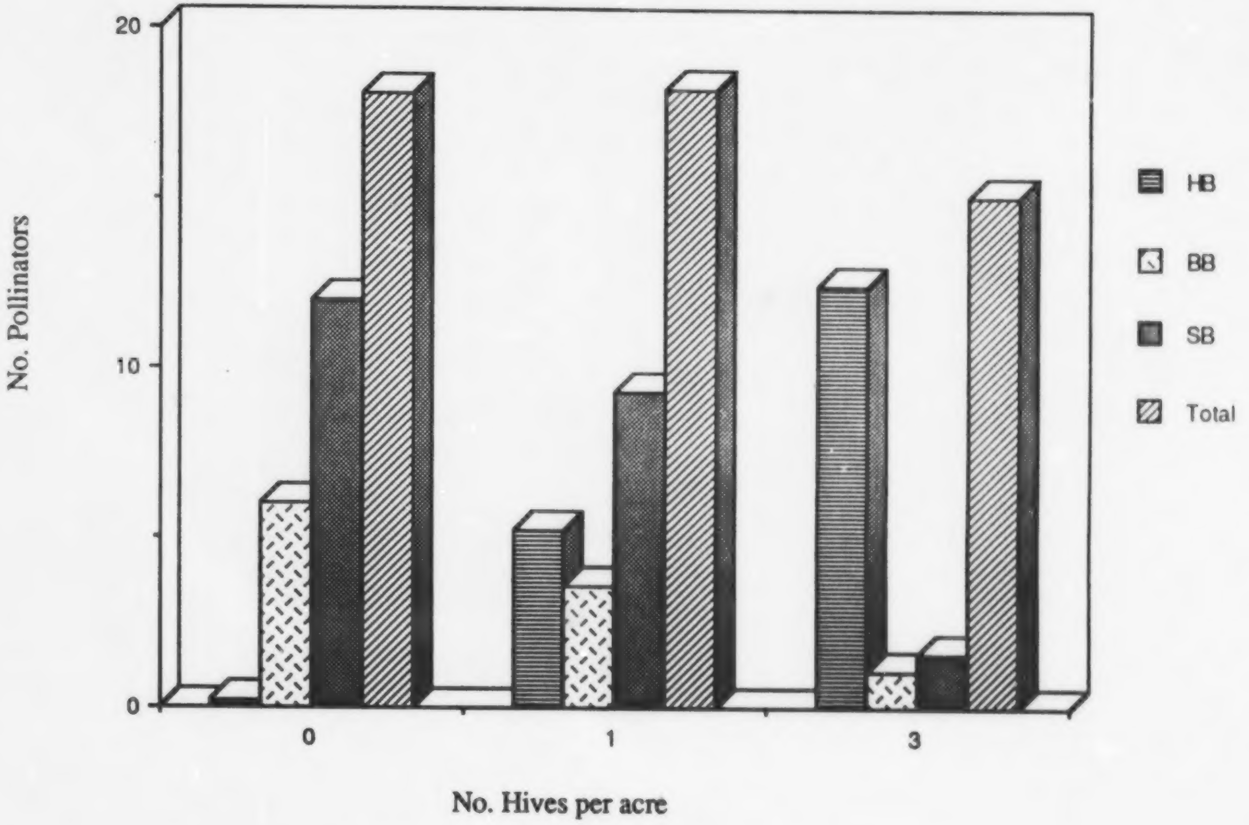


Figure 2. Mean number of honeybees, bumble bees, and solitary bees in blueberry fields with varying densities of hives - 1990.



HONEY BEE QUEEN REARING AND STOCK IMPROVEMENT

Dick Rogers, Apiculturist/Tree Fruit Entomologist

INTRODUCTION: Traditionally, Nova Scotia's 400, or so, beekeepers obtained bees and queens from producers in the southern US. With the US/Canada border closure in 1985, following the introduction and spread of parasitic bee mites, New Zealand and Australia became the only alternative sources of bee stock. However, the availability, cost, and suitability of these stocks have frequently been limiting factors to acceptance and satisfaction.

Therefore, in 1989, the Nova Scotia Beekeepers' Association applied for, and received, partial funding over three years, from the Canada/Nova Scotia Agri-Food Development for a honey bee queen rearing project. Financial, and in kind, contributions have also been received from the Blueberry Producers' Association of NS, the NS Fruit Growers' Association, the NS Beekeepers' Association and the NS Department of Agriculture and Marketing.

The objectives of the project are to evaluate, perfect, and demonstrate simple methods of rearing honey bee queens, as well as to initiate a long-term stock improvement program by annual selection and breeding of queens from hives with superior characteristics.

MATERIALS & METHODS: All work is being done in the NSDA&M Apiary located in Truro (Bible Hill), NS. The project leader is Dick Rogers and the Queen Rearing Specialist employed for the duration of the project is Jerry Draheim.

The Jenter comb unit, with removable cell bases, is being used extensively in the project. This unit ensures that larvae of the proper age are used to produce queens, and to eliminate the necessity of transferring larvae with a grafting tool. Also, the project uses 10 breeder queens, 70 mating nucs, and 30–40 support colonies.

Stock improvement was initiated with breeder queens that were selected from apiaries of Mr. E. A. Karmo, former Apiarist for NS. Mr. Karmo has been selecting and producing his own queens for many years. His bees, primarily derived from Carniolan stock, are very gentle, overwinter exceptionally well, and produce very good honey crops. Instrumental insemination is being used to maintain and upgrade project breeding stock.

RESULTS: To date, several hundred queens have been produced. Those queens not used in the project directly are distributed to NS beekeepers as breeder stock for their own queen rearing endeavors.

Jerry Draheim and Dick Rogers have conducted 2 courses, 2 organized apiary tours, several informal apiary tours, and several presentations.

Among the project's objectives for 1991 are: 1) finish a queen rearing video, 2) select another group of superior queens, from the projects evaluated stock, to be used as breeder queens, 3) offer 2 queen rearing workshops, 4) make available to NS beekeepers 300–400 queens during the months of June and July, and 5) publish several articles on queen rearing.

CONCLUSIONS: This project has contributed to the increased interest and participation in queen rearing.

ACKNOWLEDGEMENT: We would like to acknowledge the funding for this project provided by the Canada/Nova Scotia Agri-Food Development Agreement — Technology Introduction and Evaluation Program, the Blueberry Producers' Association of NS and the NS Fruit Growers' Association.

MECHANICAL MOVING OF BEE HIVES

Dick Rogers, Apiculturist/Tree Fruit Entomologist

INTRODUCTION: In Nova Scotia, the terrain in blueberry areas is often rough and treacherous. Heavy boom trucks, tractor trailers, and smaller rear wheel drive trucks with trailers have proven only barely adequate for moving large numbers of bee hives into this rugged country for blueberry pollination. Even when the hives arrive safely, additional heavy equipment or extra manpower are required for loading and unloading the hives. Often, the hives are simply not unloaded at all. This practice can be detrimental to bee colonies because of drifting and robbing bees. Also, blueberry growers find it difficult to place the number of hives they want at each location and therefore they are not able to maximize the potential benefits of using honey bees.

Moving hives into pollination areas and out again about 10 days later is very labor intensive. Therefore this system was developed so one to two people could move large numbers of bee hives to crops for pollination purposes. Also, it would assist moving hives into wintering yards, from summer pasture, for fall feeding and winter packing. Other objectives were to minimize capital investment, and be efficient with regard to fuel consumption, versatility, and reliability.

MATERIAL AND METHODS: The system utilizes a Nokka 2510 Grab-loader mounted on a Ford F350 4x4, 161 inch Wheel base, dual wheel drive truck. The grab-loader jaws were modified (Figure 1) to accommodate the lifting of a pallet designed to hold five hives (Figure 2). To stabilize the hives on the pallet, a one piece cover, made of plywood, was used. Metal band strapping held the cover and hives on the pallet.

RESULTS AND DISCUSSION: Labor costs were reduced by $6400/year. This translates into a payback on investment in about 8 years if we only consider the direct dollar saving on labor (Table 1). There are several other factors which are difficult to assign a dollar value to that would actually reduce the payback period by 2–3 years; these are as follows:

1. Truck and boom can be used for other general beekeeping activities (e.g. handling and transporting heavy honey supers).
2. Lower fuel and maintenance costs.
3. Lower bookkeeping and benefits costs because of fewer employees.
4. Ability to respond quicker to unusual bloom timing and/or pollination requests because not as reliant on human resources which are often difficult to obtain, especially on short notice.
5. This equipment configuration replaces the need for other more expensive equipment like tractor-trailers and forklifts.

TABLE 1. A simplistic comparison of costs associated with moving bees to blueberry fields (costs x '000).

	Year	1	2	3	4	5	6	7	8
Boom truck									
	Truck	37.5	0	0	0	0	0	0	0
	Boom	12.5	0	0	0	0	0	0	0
	Pallets & misc	9	0	0	0	0	0	0	0
	Labor*	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4
	Total 1	65.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4
Conventional									
	Labor**	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8
	Total 2	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8
Return on invest. (T2-T1)		-53	-46	-40	-33	-27	-21	-14	-7.6

* = 2 employees x 8 hrs/day x \$10/hr x 40 days
** = 4 employees x 8 hrs/day x \$10/hr x 40 days

The boom mounted on the 4 x 4 chassis is easy to use with a little experience. The pallets are all the same size and so positioning on the truck is not difficult. The 4WD capability makes it possible to operate in mud and less than ideal conditions.

CONCLUSIONS: The machine is quite capable of doing what it was intended for, however, the up-front costs are higher than most beekeepers could easily handle. It is not as suitable for hauling long distances on the road as a tractor-trailer unit would be. It may be practical to haul some bees by tractor trailers to blueberry fields where the hives could be mechanically unloaded. This would make better use of manpower and equipment resources.

ACKNOWLEDGEMENT: We would like to acknowledge assistance to this project provided by the Canada/Nova Scotia Agri-Food Development Agreement - Technology Introduction and Evaluation Program.

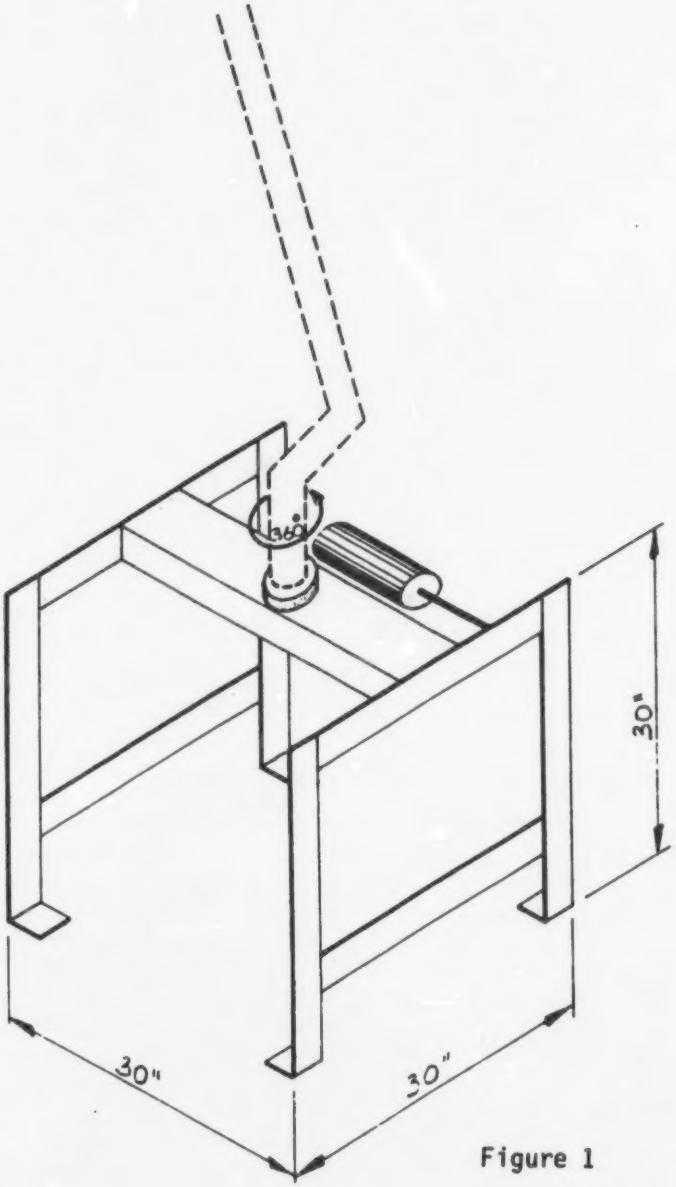


Figure 1

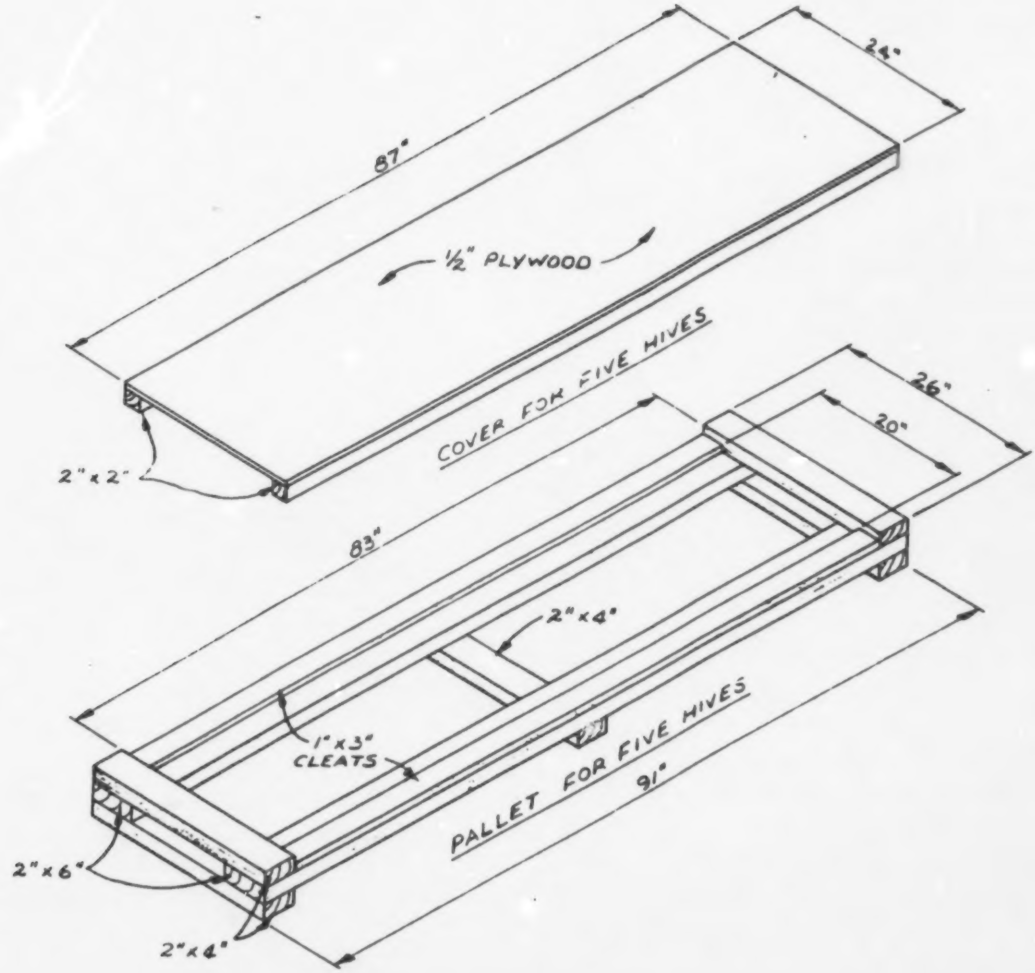

87"
24"
½" PLYWOOD
COVER FOR FIVE HIVES
2"x2"
26"
20"
83"
2"x4"
1"x3" CLEATS
PALLET FOR FIVE HIVES
91"
2"x6"
2"x4"

Figure 2

COMPUTER PROGRAM FOR BEEKEEPER REGISTRATION BEEKEEPING INDUSTRY STATISTICS

Dick Rogers, Apiculturist/Tree Fruit Entomologist

INTRODUCTION: With approximately 400 beekeepers in Nova Scotia, and a high turnover rate of "hobby" beekeepers, the record keeping required to maintain an up-to-date list of active beekeepers using a manual system is onerous. Also, beekeepers are required to register annually with the Provincial Apiculturist to comply with Provincial Acts and Regulations. The registration process generates statistics on honey yield, hive numbers, and other details.

Prior to 1990, annual registration forms were sent out to beekeepers as an attachment to the beekeeping newsletter, Beekeeping Notes. However, not all beekeepers were on the mailing list and many of those that did receive the form did not feel obligated to return it. Therefore, seldom did more than 50% of all beekeepers legally register in any given year. Industry statistics had to be compiled manually from the insufficient number of returned forms and this was a particularly frustrating and time consuming task. Limited use was made of the information on the forms because of the data gaps and cumbersome data summary capabilities. This project set out to apply computer technology to the registration process in an attempt to compile a more complete file of beekeeper names and addresses, and to improve the analysis and reporting of industry statistics.

MATERIALS AND METHODS: The program was developed on an Apple Macintosh SE/30 (1mb RAM, 40mb internal harddrive, Motorola 68030 microchip), using Filemaker II database software.

Program development involved a) design of a data entry screen, and b) preparation of reporting options. Goals for program function included a) rapid reporting based on varied queries, b) up-to-date database of beekeepers' names, addresses, and phone numbers, c) ability to select appropriate beekeepers and individualize registration renewal forms, d) rapid statistical summaries, and e) error checking and unique value data entry.

RESULTS AND DISCUSSION: The program is actually two linked programs. The first is called BEER which is an acronym for "Beekeeper Registration". BEER is somewhat like a mailing list manager, but more powerful. The other program is called BEEST which is an acronym for "Beekeeping Statistics". BEEST has very useful look-up and error checking capabilties, as well as rapid reporting scripts.

CONCLUSION: The programs performed well during the first season. Only minor format changes were required because of unforeseen demands on the system. The combination of Macintosh hardware and powerful yet intuitive software have resulted in a system that has saved many hours of specialist and secretarial time and is an essential component of the apiary inspection program.

WEED CONTROL PROGRAMS FOR NEW APPLE ORCHARDS

Douglas J. Doohan, Weed Science Extension Specialist
Keith R. Silver, Weed Science Technician

Abstract

Several herbicides have been tested in a newly planted orchard with treatments repeated annually since 1988. To this time, treatments with terbacil have given the best weed control. Nov visible herbicide injury symptoms have been seen on any ot the trees. This project will continue for at least one more year at which time major differences in tree growth and yield should be more evident.

INTRODUCTION: This trial began in 1988. At that time there were no herbicides registered for use in the first year of a new orchard planting. Simazine, terbacil, and paraquat were registered for use in apple orchards the year after planting. Simazine and terbacil are used successfully in other crops at rates much lower than those registered in apple orchards. We speculated that low rates of either herbicide, applied during the planting year, might provide adequate weed control with acceptable safety to the crop. An experimental herbicide, oxadiazon, showed promise for use in orchards as well. Paraquat has not been recommended during the planting year, due to high risk of serious crop injury, resulting from direct contact of spray with green bark of the tree.

The objective of this study was to evaluate simazine, terbacil, paraquat, and oxadiazon in the planting year. Simazine and terbacil were applied at both the minimum registered rate, as well as half the minimum rate registered for use on apples. Oxadiazon was applied at rates recommended by the manufacturer. The application of paraquat, as with all treatments, was directed with precision to minimize contact with the trees. During the second and third growing seasons, paraquet was tank mixed with the other three herbicides to burn off emerged weeds.

This trial will be continued with treatments applied each year, until the trees begin bearing fruit which should happen in 1991. Comparisons are being made between the herbicide treatments, hand weeded plots and weedy checks. The data should indicate strengths and weaknesses of the treatments in the spectrum of weeds being controlled. Additionally, growth response of the trees and initial yield figures should be indicators of favourable or detrimental effects on trees.

MATERIALS AND METHODS: Apple trees of the cultivar McIntosh on rootstock EM7A were planted in a Somerset loamy sand soil at Lakeville, Kings County, Nova Scotia on June 14, 1988. Herbicide treatments were applied June 14, 1988, May 11, 1989, and May 8, 1990. The paraquat only treatment, received a second application each year on August 8, 1988, July 7, 1989, and July 12, 1990, respectively. Residual herbicides were not combined with paraquat in 1988.

All applications were made in 200 l/ha of water and applied at 207kPa pressure. The experimental design was a randomized complete block with six replications. Plots were 2m by 4.9m including only one tree per plot.

In 1990, weed control was assessed May 28 and August 23. Tree growth response was measured April 10, 1990. Weed control ratings were made visually and are reported on a scale of 0 to 100 percent; where 0 equals no weed control and 100 equals complete weed control.

Weeds present in the trial (in order of prevalence in weedy checks) were quackgrass, tufted vetch, dandelion, and common ragweed. Other occasional weeds were lamb's quarters, barnyard grass, and smooth crab grass.

RESULTS AND DISCUSSION: None of the herbicide treatments caused visible crop injury. Growth of trees in weedy check plots was slightly less vigorous (Table 1). Growth measurements have not been taken since April 1990; however, trees were visibly less vigorous in the weedy check plots as the 1990 growing season progressed. The highest weed control ratings resulted from using terbacil (Table 1). Even at one half the registered rate, August evaluations show terbacil giving far superior weed control than the other herbicides.

The repeated paraquat treatments allowed regrowth of perennial weeds after burning off top growth. This treatment also allowed for the establishment of seedling annuals because it lacks any residual activity.

This site had previously grown corn. This would explain why simazine is not controlling lamb's quarters (due to a triazine resistant bio-type).

Table 1: Herbicide Treatments Used in the Study
Crop Response and Weed Control Ratings

Treatment	Rate/ha kg active	Date applied	Tree Growth cm*		Weed Control		Weed Escapes**	
			Circ.	Length	(05 28)	(08 23)	(05 28)	(08 23)
Hand weeded control	—	—	9.4	74	84	93	QG,DL,VT	QG,DL,LQ, VT,BY
Weedy control	—	—	8.8	50.1	16	0	QG,DL,VT, RW	QG,VT,DL, RW
oxadiazon + paraquat	2.0 + 1.1	05 08	8.9	70.5	68	10	QG,DL	QG,RW,DL, BY,VT
oxadiazon + paraquat	4.0 + 1.1	05 08	9.3	82	92	28	QG,DL	QG,RW,DL, VT,BY
simazine + paraquat	1.0 + 1.1	05 08	8.9	71.6	53	11	VT,DL,QG	VT,QG,LQ CG,BY,DL
simaxine + paraquat	2.25 + 1.1	05 08	9.0	65.7	47	20	VT,DL,QG	VT,LQ,CG, BY,QG
terbacil + paraquat	0.9 + 1.1	05 08	8.8	64	80	69	VT	VT,BY
terbacil + paraquat	1.8 + 1.1	05 08	8.8	66	98	98	VT	VT,CG
paraquat; paraquat	1.1; 1.1	05 08; 07 12	8.9	68	56	28	VT,DL,QG	VT,LQ,DL, BY

* Tree growth measurements represent the circumference of the tree trunks at a height of 30 cm. The length is that of the last years growth on the central leader.

** Weed escapes listed in order of prevalence and do not necessarily include all species present.

Weeds present in the trial were: QG=quackgrass, VT=tufted vetch, DL=dandelion, RW=common ragweed LQ=lamb's quarters, BY=barnyard grass, CG=smooth crab grass

CONCLUSIONS: As this is still an ongoing trial, conclusions on the effect of treatments on tree performance will be more evident in the future. As for the performance of herbicides on weeds, certain trends are appearing. Treatments with oxadiazon, in addition to being weak on quackgrass and dandelions, also allow some ragweed and barnyard grass to escape. This product is having some effect on the control of tufted vetch. Simazine has absolutely no effect on tufted vetch and very little on quackgrass. Higher rates are required to insure good dandelion control. Terbacil has given surprisingly good control of tufted vetch and quackgrass.

Many plots have complete bare ground at the minimum recommended rate. Paraquat by itself, not only allows the regrowth of tufted vetch and quackgrass, but also seems to encourage the establishment of dandelions.

It would appear that given sufficient time, each treatment if continued to be repeated annually, would develop its own unique flora population.

ACKNOWLEDGEMENTS: We wish to thank the staff of COBI Foods, Orchard Division, in Berwick, Kings County for the use of their orchard and for their co-operation in working around our trial area with their own weed control program.

THE EFFECT OF SPRING HERBICIDE APPLICATIONS ON FALL GERMINATED PERENNIAL WEEDS IN STRAWBERRIES

Douglas J. Doohan, Weed Science Extension Specialist
Keith R. Silver, Weed Science Technician

Abstract

Numerous herbicide treatments were applied in the early spring, soon after the removal of straw mulch. Weed species being evaluated were sheep sorrel, grass-leaved stitchwort and four-seeded vetch. All weeds were present as established seedlings that had germinated the previous fall. Depending on weed species, control rating ranged from 0 to 100%. Several treatments resulted in unacceptable levels of crop injury.

INTRODUCTION: One of the most critical times to have herbicides working in strawberry fields is the early fall (September and October). Too frequently we find strawberry growers using a herbicide early in the summer of the planting year, followed by cultivation and hand weeding until September. With a weed free field in early autumn, they feel they have controlled the weed problems for the first year. Too frequently they rely on frost to kill weed seedlings germinating thereafter until freeze-up. What is not commonly understood or frequently overlooked is that a large portion of weeds germinating in the autumn are either winter annuals or perennial weeds, which are not killed by freezing temperatures.

The initial objective of these experiments was to evaluate herbicides as late fall treatments to control sheep sorrel, grass-leaved stitchwort and four-seeded vetch, which are fall germinating weeds. An early onset of winter weather terminated these plans and the next opportunity for application was early spring.

This report combines the results of two trials

MATERIALS AND METHODS: The field chosen for this study had strawberry plants of the cultivars Honeoye and Kent planted May 21, 1989. The site was on a Nictaux loamy sand soil in Rockland, Kings County, Nova Scotia.

Treatments in the first trial (Table 1), were applied to Honeoye strawberries and sheep sorrel seedlings May 2, 1990. The second trial (Table 2) was treated May 4, 1990. In this second trial the plots included both Kent and Honeoye strawberries. The weeds consisted of sheep sorrel, grass-leaved stitchwort and four-seeded vetch seedlings. With both trials, the overwintering straw mulch had recently been removed from the berry rows.

All treatments were applied in 240 *l*/ha water at 260 kPa pressure. The experimental design was a randomized complete block with four replications. Plot size was 2 M x 5 M.

Weed control and crop tolerance were assessed June 19, 1990 on the first trial and June 25, 1990 on the second trial. Ratings were made visually and are reported on a scale of 0 to 100 percent, where 0 equals no weed control or crop injury and 100 equals complete control of weeds or death of crop.

RESULTS AND DISCUSSION: The best control of sheep sorrel (Table 1 and Talbe 2) resulted with the use of propyzamide, clopyralid and dicamba. The dicamba treatments caused excessive crop injury.

The best control of grass-leaved stitchwort resulted with treatments of terbacil, naprapamide, diphenamid and simazine.

The four-seeded vetch was controlled 100 percent with treatments of clopyralid, 2,4-D amine and dicamba. Good vetch control was also obtained with treatments of terbacil, diphenamid and oxyfluorfen.

Table 1: Herbicide Treatments Used in the First Trial Crop Response and Weed Control Ratings

Treatment	Rate/ha kg active	Crop Suppression	Control of Sheep Sorrel
chlorthal-dimethyl	11.0	9	24
diphenamid	6.75	7	34
chloroxuron	6.75	15	56
simazine	1.1	8	64
simazine	1.6	6	27
terbacil	0.55	9	60
terbacil	0.7	28	66
propyzamide	1.1	26	46
propyzamide + simazine	1.1 + 1.1	9	84
2,4-D amine	1.0	3	31
clopyralid	0.15	5	51
clopyralid	0.3	12	84
dicamba	0.4	19	84
oxyfluorfen	0.5	5	40
oxyfluorfen	1.0	23	32
napropamide	4.5	9	24
Weedy control	—	6	0

Table 2: Herbicide Treatments Used in the Second Trial Crop Response and Weed Control Ratings

Treatment	Rate/ha kg active	Crop Suppression* K	H	Weed Control* SS	SW	VT
chlorthal-dimethyl	11.0	0	0	5	22	25
diphenamid	6.75	0	0	70	91	86
chloroxuron	6.75	0	2	0	51	51
simazine	1.1	1	3	45	73	75
simazine	1.6	20	15	55	75	72
terbacil	0.28	0	0	40	79	80
terbacil	0.55	40	18	50	99	95
propyzamide	1.1	0	12	92	33	25
2,4-D amine	1.0	0	4	18	0	100
clopyralid	0.05	0	0	25	0	100
clopyralid	0.1	0	0	72	0	100
clopyralid	0.2	4	0	65	0	100
dicamba	0.2	8	10	60	70	100
dicamba	0.4	30	38	85	75	100
oxyfluorfen	0.5	13	30	60	16	86
napropamide	4.5	0	10	25	92	61
Weedy control	—	0	0	0	0	0

* K=Kent; H=Honeoye; SS=sheep sorrel;
SW=grass-leaved stitchwort; VT=four-seeded vetch

CONCLUSION: Clopyralid is one of the safest postemergence herbicides to use on strawberries. Preferably the control of sheep sorrel should be attempted with either diphenamid preemergence and clopyralid as an early postemergence treatment in the early fall or clopyralid as an early postemergence followed by propyzamide in late fall before freeze-up. In a similar manner, herbicides that worked on stitchwort in this study, diphenamid, simazine, terbacil and napropamide, should be screened as preemergence and early postemergence treatments to stitchwort seedlings in the early fall. The four-seeded vetch, though readily controlled with postemergence treatments, should also be screened for control with preemergence herbicides. This also should be done for the more persistant tufted vetch.

ACKNOWLEDGEMENTS: We express our gratitude to Wayne Silver of Rockland, Kings County, for his co-operation and the use of his crop land for this study.

EFFECT OF SPRING HERBICIDE APPLICATIONS ON CREEPING BUTTERCUP IN STRAWBERRIES

Douglas J. Doohan, Weed Science Extension Specialist
Keith R. Silver, Weed Science Technician

Abstract

Numerous herbicide treatments were applied in early spring to seedling and established buttercup plants infesting a strawberry plantation. Results indicate that napropamide is effective against the seedling stage. Suppression of established buttercup plants was most effective with propyzamide treatments.

INTRODUCTION: Established perennial weeds are difficult to control in strawberries. Creeping buttercup is especially common in strawberry fields planted on poorly drained soils. If permitted to grow unchecked; creeping buttercup is so competitive that it will completely crowd out the strawberry plants. The objective of the experiments reported was to evaluate herbicides for control of seedling and established buttercup. These trials had been planned for the fall of 1989, but the onset of early winter weather did not permit the spray application until spring 1990.

MATERIALS AND METHODS: The field chosen for this study had strawberry plants of the cultivar Blomidon planted May 26, 1989. The site was on a Nictaux loamy sand soil in Rockland, Kings County, Nova Scotia.

Three experiments were conducted. One trial was directed at a population of buttercup plants that were small, having germinated in September and October 1988, following an August weeding and cultivation. The second screening trial was directed at well-established creeping buttercup plants, that had germinated earlier in the summer of 1989, following a June weeding and cultivation. A third trial involved evaluation of various rates of propyzamide against well established creeping buttercups.

Treatments in the first trial (Table 1), were made in two postemergence applications, Post 1 and Post 2. The Post 1 treatments were applied during a light rain on May 14, 1990. It was hoped that the herbicide would wash off the strawberry leaves and thereby reduce crop injury. The Post 2 treatments were applied May 15, 1990, under overcast conditions with moist foliage and soil. Treatments in the second trial (Table 2), were applied postemergence on May 10, 1990, under clear weather conditions with dry foliage and soil. Treatments in the third trial (Table 3), were applied on the same date, under similiar conditions as the second trial.

All treatments were applied in 240 *l*/ha water at 260 kPa pressure. The experimental design was a randomized complete block with four replications. Plot size was 2 M x 5 M.

Weed control and crop tolerance in the first and second trial were assessed May 28 and July 12, 1990. Assessment of the third trial was May 28 and July 11, 1990. Ratings were made visually and are reported on a scale of 0 to 100 percent; where 0 equals no weed control or crop injury and 100 equals complete control of weeds or death of crop.

RESULTS AND DISCUSSION: Control of creeping buttercup in the first trial was inadequate with all treatments, when evaluated on May 28 (Table 1), two weeks after treatment. However, by July 12, napropamide was providing 84% of creeping buttercup with only minimal crop injury. Most of the other treatments in this first trial gave undesirable crop injury and were ineffective on creeping buttercup.

Herbicides evaluated on established creeping buttercup (Trial 2) did not provide adequate control; crop injury was variable.

In the third trial propyzamide provided fair to good control (74 to 80%) of creeping buttercup when evaluated on May 28, 18 days after treatment. (Table 3) However, by July 11 control had deteriorated and was unacceptable in all but plots treated with 2.0 kg/ha. Crop suppression was unacceptable with rates of propyramide in excess of 1.0 kg /ha.

Table 1: Herbicide Treatments Used in the First Trial
Crop Response and Weed Control Ratings

Treatment	Rate/ha kg active	Method	Crop Suppression *		Buttercup Suppression *	
			(05 28)	(07 12)	(05 28)	(07 12)
chlorthal-dimethyl	11.0	Post 1	SL CH	0	0	0
diphenamid	6.75	Post 1	SL CH	2	SL ST	22
chloroxuron	6.75	Post 1	SL CH	SL BN	SL BN	0
simazine	1.1	Post 1	SL CH	SL CH	SL CH	0
simazine	1.6	Post 1	MOD CH	10,MOD CH	MOD CH	10
terbacil	0.28	Post 1	SL CH	3	SL CH	0
terbacil	0.55	Post 1	MOD CH	5,SL CH	SL CH	5
propyzamide	1.1	Post 1	MOD CH	5	MOD BN	38
propyzamide + simazine	1.1 + 1.1	Post 1	MOD CH	15	MOD BN	40
propyzamide + terbacil	1.1 + 0.55	Post 1	MOD CH,MOD BN	11	SL CH, SL BN	25
oxyfluorfen	0.25	Post 1	SEV BN	6	SEV ST	18
napropamide	4.5	Post 1	MOD CH	5	SL ST	84
2,4-D amine	1.0	Post 2	MOD EP	4 MOD EP	10	
MCPA amine	0.5	Post 2	SEV EP	32	SEV EP	15
dicamba	0.2	Post 2	SL EP	18	MOD EP	3
dicamba	0.4	Post 2	MOD EP	14, DEF	SEV EP	10
dicamba + simazine	0.2 + 1.1	Post 2	MOD CH, EP	10, SL CH	MOD EP	15
Weedy Control	—	—	10	20	0	0

* Other than the numercal values used for crop and suppression, injury symtoms were expressed as:
SL—slight, MOD—moderate, SEV—severe, CH—chlorosis, ST—stunting, BW—leaf burn and EP—epinesty.

**Table 2: Herbicide Treatments Used in the Second Trial
Crop Response and Weed Control Ratings**

Treatment	Rate/ha kg active	Crop Suppression* 05 28	Crop Suppression* 07 12	Buttercup Suppression* 05 28	Buttercup Suppression* 07 12
simazine	1.6	MOD CH	SL CH, ML BN	3	5
terbacil	0.7	MOD CH	SL CH	25	0
propyzamide	1.1	SL CH	10	55	30
propyzamide + simazine	1.1 + 1.1	MOD CH	8, SL CH	58	21
propyzamide + terbacil	1.1 + 0.55	MOD CH	SL CH	63	34
2, 4-D amine	1.0	MOD EP	5	35	35
MCPA amine	0.5	SEV EP	36	63	58
dicamba	0.4	MOD EP	10, SL EP	43	12
dicamba + simazine	0.4 + 1.1	SL CH EP	15, SL EP	54	35
oxyfluorfen	0.5	SEV BN	14	79	15
Weedy control	—	15	30	0	0

*Other than the numerical values used for crop and weed suppression, injury symptons were expressed as: SL—slight, MOD—moderate, SEV—severe, CH—chlorosis, ST—stunting, EP—epinesty, BN—leaf burn and MLBN—marginal leaf burning.

**Table 3: Herbicide Treatments Used in the Third Trial
Crop Response and Weed Control Ratings**

Treatment	Rate/ha kg active	Crop Suppression 05 28	Crop Suppression 07 11	Buttercup Suppression 05 28	Buttercup Suppression 07 11
propyzamide	1.0	8	1	74	21
propyzamide	1.25	9	21	74	48
propyzamide	1.5	9	20	80	54
propyzamide	2.0	18	58	86	70
Weedy control	—	15	30	0	0

CONCLUSION: For the best results treatments with propyzamide should be applied in the fall rather than spring as was done here. Many of the treatments in the first trial should be evaluated earlier in the planting season. This would allow for either preemergence treatments or early postemergence treatments when the buttercup seedlings are very small. Some of the more promising treatments have been preemergence napropamide, fall applied propyzamide and late fall MCPA.

As with any perennial weed, the first line of defence should be prevention of weed establishment.

ACKNOWLEDGEMENTS: We express our gratitude to Wayne Silver of Rockland, Kings County for his co-operation and the use of his crop land for this study.

THE EFFECT OF FALL HERBICIDE APPLICATIONS ON SHEEP SORREL IN STRAWBERRIES

D. J. Doohan, Weed Science Extension Specialist
K. R. Silver, Weed Science Technician

Abstract

The response of strawberries and sheep sorrel to herbicide treatments applied in the late fall, before freeze-up, was evaluated. Propyzamide provided 73 and 88 percent control of sheep sorrel at 1.1 and 1.5 kg/ha, respectively and clopyralid at 0.30 kg/ha provided 55 percent control.

INTRODUCTION: Sheep sorrel is a perennial weed, spreading by rhizomes and seeds. The herbicides propyzamide and clopyralid, both registered for use on strawberries, are known to suppress sheep sorrel. This study was conducted to evaluate the response of sheep sorrel and the crop to increased rates of these herbicides. Additionally, the activity of five other herbicide, known to be selective on strawberries, was evaluated on sheep sorrel.

MATERIALS AND METHODS: The field chosen for this study had strawberry plants of the cultivar Bounty planted in June, 1988. The site was on Nictaux loamy sand soil in Rockland, Kings County, N. S.

Treatments were applied postemergence, before freeze-up, on November 18, 1989. The field had a very heavy infestation of established sheep sorrel.

Treatments were applied in 240 L/ha water at 262 kPa pressure. The experimental design was a randomized complete block with four replications. Plot size was 2 M x 5 M.

Weed control and crop tolerance were assessed June 19, 1990. Ratings were made visually and are reported on a scale of 0 to 100 percent; where 0 equals no weed control or crop injury and 100 equals complete control of weeds or death of crop.

RESULTS AND DISCUSSION: The herbicide propyzamide gave the best control of sheep sorrel but also caused the most crop suppression (Table 1). The effectiveness of propyzamide was reduced when tank mixed with simazine.

Clopyralid provided suppression of sheep sorrel. The response increased dramatically when the rate of clopyralid was increased from 150 grams to 300 grams active/ha (Table 1). However, control was still not commercially acceptable. Dicamba was not toxic to the crop but did not control sheep sorrel. Treatments with terbacil, either alone or in combination with propyzamide, had little effect on the established sheep sorrel.

CONCLUSION: Propyzamide and clopyralid provided the best control of sheep sorrel. Future research should evaluate a sequential treatment regime of clopyralid applied in the early fall followed by a late fall application of propyzamide.

ACKNOWLEDGEMENTS: We express our gratitude to Wayne Silver of Rockland, Kings County for his co-operation and the use of his crop land for this study.

Table 1: Herbicide treatments used in the study, crop response and weed control ratings.

Treatment	Rate/ha kg active	Crop Suppression	Sheep Sorrel Suppression
simazine	1.6	3	28
terbacil	0.7	0	15
propyzamide	1.1	15	73
propyzamide	1.5	19	88
propyzamide + simazine	1.1 + 1.1	18	65
propyzamide + terbacil	1.1 + 0.55	13	74
2,4-D amine	1.0	0	3
clopyralid	0.15	5	20
clopyralid	0.3	6	55
dicamba	0.4	0	25
oxyfluorfen	1.0	8	31
Weedy control	-	0	0

WEED CONTROL WITH GLEAN (CHLORSULFURON) IN LOWBUSH BLUEBERRIES

John P. Thomson, District Weed Inspector
Keith R. Silver, Weed Science Technician

Abstract

This trial evaluates the tolerance of lowbush blueberries to fall applications of the herbicide Glean. Applications of 30 to 38 g/ha provided some suppression of bunchberry without crop injury. Higher rates injured the crop. Teaberry was suppressed at rates of 23 g/ha and higher.

INTRODUCTION: The registration of Velpar for use in lowbush blueberries has resulted in excellent broad sprectrum weed control and a corresponding increase in berry production. Unfortunately a few weed species are resistant to Velpar and proliferate rapidly when this herbicide is used. Two such weeds are bunchberry and teaberry.

Because of its activity on a broad spectrum of difficult-to-control weeds, the herbicide Glean was selected for evaluation in this trial.

MATERIALS AND METHODS: To reduce the uptake of herbicide by the blueberry plants, application was delayed until late fall, after defoliation of the crop. Bunchberry and teaberry still retained their leaves at the time of application. The field chosen for this trial was on Herbert sandy loam in Parrsboro, Cumberland County, Nova Scotia.

Treatments were applied November 9, 1988. All treatments were applied in 240 *l*/ha water at 262 kPa pressure. The experimental design was a randomized complete block with four replications. Plots are 2 M x 5 M in size.

The entire trial area was pruned by burning in April 1989. It also received an overall application of Velpar at 1.75 kg active/ha in May, 1989.

Visual assessment of weed population and crop stand were made at the time of application (November 9, 1988) and again September 21, 1990 at the time of crop harvest. All Glean treatments were applied with 0.1% Agral 90 surfactant in the spray solution. The assessment of results are reported as an estimate of the percentage of total ground covered by each plant species.

RESULTS AND DISCUSSION: A rate of 23 grams active Glean/ha had no effect on the growth of blueberries or bunchberry (Table 1), but all rates of Glean reduced the teaberry stand. All rates of 30 grams active/ha or higher reduced the population of bunchberry. Rates of 45 and 53 grams active/ha caused slight reductions in the blueberry stand. Other miscellaneous weeds were totally controlled at all rates of Glean. Increasing the rate of Glean continued to increase the percentage of bare ground in the plots, an accumulated effect of increased weed control and reduced crop stand.

CONCLUSION: Though the herbicide Glean gives some measure of control of bunchberry and teaberry, the reduction of crop stand is reason for concern. Further study of this herbicide should include different timings of application in search of a window that would allow for better weed control and greater crop safety.

Table 1: Herbicide Rates Used in the Study
Crop Response, Weed Control Ratings,And Yields From Plats

	Rate/ha	%Ground Covered By										
	grams	Blueberries		Bunchberry		Teaberry		Other Weeds		Bare Ground		Yield
Treatment	active	B*	A**	B*	A**	B*	A**	B*	A**	B*	A**	kg/ha
Weedy control	0	46	49	38	40	9	6	7	4	0	1	3335
Glean	23	40	38	39	41	15	6	6	0	0	19	2933
Glean	30	39	40	40	31	16	10	5	0	0	19	5003
Glean	38	39	38	36	26	20	10	5	0	0	26	2780
Glean	45	44	40	35	26	14	3	7	0	0	31	4010
Glean	53	38	33	39	21	16	1	7	0	0	45	2430

* B — before application 11 09 88
** A — at assessment 09 21 90

TOLERANCE OF LOWBUSH BLUEBERRIES TO TRIAZINE HERBICIDES

J. P. Thomson, District Weed Inspector
K. R. Silver, Weed Science Technician

Abstract

The tolerance of lowbush blueberries to high rates of two triazine herbicides, atrazine and simazine was evaluated. Control of yellow loosestrife and teaberry was also evaluated. Blueberries in this trial will be fruiting during the 1991 season.

INTRODUCTION: The use of Velpar in lowbush blueberries results in the proliferation of isolated patches of resistant weeds. Lowbush blueberries have excellent tolerance of the triazine herbicides at registered rates. The objective of this trial was to determine crop tolerance at higher rates and control of Velpar resistant weeds.

MATERIALS AND METHODS: The field chosen for this trial was on Kirkmount sandy loam, near Sunnybrae, Pictou County, Nova Scotia.

Treatments were applied preemergence on April 25, 1990, following pruning of the field by burning. All treatments were applied in 240 L/ha water at 262 kPa pressure. The experimental design was a randomized complete block with four replications. Plot size was 2 M x 5 M.

Rates of atrazine and simazine of 8, 12 and 16 kg active/ha were applied in multiple passes of 4 kg active/ha (ie. 16 kg active = 4 kg active in 240 L water x 4 passes = 16 kg active in a total of 960 L/ha water). This method was made necessary by the physical limitation of keeping the herbicides suspended in the water medium.

The assessment of crop injury was made August 27, 1990. Weed control, if any, will be better evaluated during the fruiting year, 1991.

RESULTS AND DISCUSSION: No visual crop injury was evident with any of the herbicide treatments used. The yellow loosestrife plants appeared to be attacked by disease organisms this season. Hopefully, an assessment earlier than August of the 1991 season, may show if this weed responded to the herbicide treatments. Visual differences in the teaberry stand were not especially noticeable during the 1990 growing season.

CONCLUSION: The effect of the herbicide treatments on the blueberry crop will be better assessed if yields of fruit can be harvested from these plots in 1991. Some determinations for such herbicide treatments must necessarily be considered. Will any of the treatments result in herbicide residue in the fruit? What other Velpar resistant weeds, if any, should these treatments be evaluated on? What are the possibilities of these herbicides ending up in ground water, even if such rates were limited to spot treating limited infestations of Velpar resistant weeds?

ACKNOWLEDGEMENTS: Thanks goes out to Allan Thomson and family of Bridgeville, Pictou County, Nova Scotia for their co-operation and use of their land for this study.

HERBICIDE SCREENING IN SNAPBEANS

Douglas J. Doohan, Weed Science Extension Specialist
Keith R. Silver, Weed Science Technician

Abstract

Herbicides were evaluated as alternatives to dinoseb for the control of annual broadleaf weeds in snapbeans. Preemergence herbicides which provided equivalent or better weed control than dinoseb were clomazone, lactofen, metobromuron and monolinuron. Postemergence treatments of the herbicides fomesafen, TF 1222 and bentazon also provided control equivalent to that obtained with dinoseb. These treatments need further evaluation under varying cultivars, soil, and weather conditions to determine their safety on the snapbeans.

INTRODUCTION: The present registration of dinoseb for use on snapbeans is only temporary until a suitable replacement herbicide can be found. An alternative to dinoseb would ideally be of low cost, provide broad spectrum weed control and have an excellent record for crop safety.

Of the registered herbicides used in this trial, chloramben does not give consistently good control. Moreover, the manufacture of the product is being discontinued. Metobromuron and monolinuron are considered too risky by many of the local growers, since heavy rainfall after application of these products can cause considerable crop injury. The bentazon treatments do not provide as wide a spectrum of weed control as does dinoseb. Timing of bentazon application is also critical and quite restrictive.

The experimental compounds clomazone, lactofen, fomesafen and TF 1222 are all included in this trial because the companies manufacturing these products consider them to have potential use for weed control in snapbeans.

The products evaluated in this trial are basically aimed at the control of annual broadleaf weeds. The use of preplant incorporated EPTC has become a common practice for the control of annual grasses in snapbeans. Therefore, the field chosen for this trial received an EPTC treatment before planting. The weeds being evaluated in this trial are only those that escaped the EPTC treatment.

MATERIALS AND METHODS: Snapbeans of the cultivar Labrador were seeded in a Cornwallis loamy sand soil at Woodville, Kings County, Nova Scotia on July 4, 1990. Preemergence treatments (pre) were applied July 5, 1990. Postemergence treatments (post) were applied August 4, 1990. At the time of postemergence treatments, snapbeans were in the 3-4 trifoliate leaf stage. Most weeds were late germinating and were in the 2-4 leaf stage up to 3 cm high. Additionally, there were a few patches of early germinating lamb's quarters 15-20 cm high.

All treatments were made in 240 *l*/ha water and applied at 262 kPa pressure. The experimental design was a randomized complete block with four replications. Plots were 2 M by 5 M in size.

Weed control and crop tolerance were assessed August 24, 1990. Ratings were made visually and are reported on a scale of 0 to 100 percent; where 0 equals no weed control or crop injury and 100 equals complete control of weeds or death of crop.

RESULTS AND DISCUSSION: Weeds that were present in the trial (in order of their predominance) were lamb's quarters, low cudweed, marsh yellow cress, common chickweed, pineappleweed, annual sow thistle, broad-leaved plantain, and pink corydalis.

Lack of precipitation until the week of July 23, resulted in pre treatments not being activated in the weed germination zone of the soil. This allowed some weed seedlings to escape. Therefore, weed control (Table 1) with most pre treatments was slightly less than one would normally expect. The poorest weed control results were with the chloramben treatments.

The dinoseb treatment gives the broadest spectrum of weed control. The bentazon treatments gave excellent weed control and only minor crop injury. The herbicide lactofen looks promising as a pre treatment but the post treatment caused unacceptable crop injury. The pre lactofen as well as treatments with clomazone, fomesafen and TF 1222 performed well enough to warrant further evaluation.

Metobromuron and monolinuron caused no serious crop injury, probably due to lack of rain at the time of crop germination. All postemergence herbicides caused a degree of injury on the bean leaves contacted at the time of application. Subsequent leaves developed without herbicide injury. Injury was greatest (10%), with the post treatment of lactofen.

CONCLUSION: For the present there is no truly satisfactory replacement for dinoseb for weed control in snapbeans. The primary deficiency of most alternatives is an inadequate spectrum of weeds controlled. Treatments with clomozone, fomesafen, TF 1222 and pre lactofen performed well enough to warrant further evaluation.

ACKNOWLEDGEMENTS: We wish to thank Peter Clarke of Woodville, Kings County for the use of his bean field for this trial and for his co-operation in not spraying over our trial area.

Table 1: Herbicide Treatments Used in the Study Crop Response and Weed Control Ratings

Treatment	Rate/ha kg active	Method	Crop Injury	Weed Control	Weed *** Escapes
clomasone	0.50	Pre I**	0	79	YC,CW,PL,PC,LQ,CH
clomasone	0.50	Pre	0	88	YC,PL,CW,PC,PW
lactofen	0.2	pre	0	91	CW,CH,YC,LQ,PW,PL,ST
chloramben	2.0	pre	0	41	CW,YC,CH,ST,LQ,PW
chloramben	3.36	pre	0	55	CW,YC,PL,PW,ST,LQ,CH,PC
metobromuron	1.0	pre	0	75	CW,CH,LQ,YC,PL,ST,PW,PC
metobromuron	1.2	pre	1	96	LQ,CW,CH,PW,PL,ST,YC
monolinuron	1.1	pre	0	98	LQ,CH,CW,PL
monolinuron	1.4	pre	3	95	LQ,CH,ST
dinoseb ester	3.36	pre	0	88	LQ
lactofen	0.1	post	10 (LL)****	88	CW,LQ,ST,YC
fomesafen + agral 90	0.25 + 0.1%	post	2 (LL)	96	LQ,CH,CW
TF 1222 + SOC	0.58 + 1.0%	post	1 (LL)	99	CH,PW
bentazon + Assist	0.85 + 2*l*	post	1 (LL)	99	LQ,CH,PC,PL
bentazon + Assist	1.08 + 2*l*	post	3 (LL)	99	LQ,PL,CH,YC,PC
Basagran Forte	1.08	post	1 (LL)	99	CH,PL,LQ,PC
Basagran Forte + fomesafen	— 0.84 + 0.14	post	3 (LL)	99	LQ,CH
Weedy Control	—	—	0	0	LQ,CW,YC,CH,PW,ST,PL,PC
Hand weeded control	—	—	0	91	LQ,ST,CW,CH,PW,PL,YC

** (Pre. I) preemergence incorporation was done shallowly with a garden rake.

*** All escape weeds are listed in their order of prevalence within the treatment.
LQ=lambsquarters; CW=low cudweed; YC=marsh yellow cress; CH= common chickweed;
PW=pineappleweed; ST= annual sow thistle; PL=broad-leaved plantain: PC=pink corydalis

**** (LL) refers to damage on the lower leaves of the beans resulting from direct herbicide contact at the time of postemergence applications. Number ratings on crop injury indicate crop suppression.

HERBICIDE SCREENING IN PEAS

D. J. Doohan, Weed Science Extension Specialist
K. R. Silver, Weed Science Technician

Abstract

In the search for alternative herbicides to dinoseb for the control of annual broadleaf weeds in peas, several factors became evident. The bentazon treatments give good weed control and excellent crop safety. Treatments with metribuzin cause unacceptable crop injury. Treatment with MCPA/MCPB does not give broad spectrum weed control and causes more crop injury than MCPA sodium salt. In fact the MCPA sodium salt appears safer than indicated from a reading of the red insert to Publication 75 "The Guide to Weed Control". The new experimental compound clomazone provided excellent weed control. Though initially this product caused a lot of chlorosis on the crop, later observations found the crop recovering extremely well.

INTRODUCTION: The present registration of dinoseb for use on peas is only temporary until a suitable replacement herbicide can be found. For this purpose, a herbicide would have to be relatively inexpensive, give broad spectrum weed control and have excellent safety on the crop. The use of pre-plant incorporated trifluralin has become essentially a standard treatment for the control of annual grasses in peas. Therefore, the products being evaluated in this trial were all aimed at the control of annual broadleaf weeds.

The treatments of MCPA sodium salt, MCPA amine and MCPA/MCPB used in Ontario are not recommended for use in the Atlantic Provinces due to concerns for crop safety. These herbicides are included in this trial to re-evaluate their performance. Although these growth regulator herbicides are amongst the least expensive treatments, they are known to have weaknesses in the spectrum of broadleaf weeds controlled.

Applications of clomazone were included because the manufacturer considers the product to have potential for use in this crop.

Treatments with prometryne and bentazon were evaluated because both products are registered for use on peas. Treatments with these products are among the more costly herbicides. The herbicide metribuzin is registered for use on field peas in Western Canada. Therefore, an extensive evaluation program has been initiated here in hopes that metribuzin might be registered for our pea crops under a minor use proposal.

MATERIALS AND METHODS: Peas of the cultivar Dark Green Perfection were seeded at Waterville, Kings County, N. S. on June 2, 1990. Prior to planting the field had received a pre-plant incorporated treatment of trifluralin for control of annual grasses. Preemergence treatments (Pre.) were applied June 7, 1990. Postemergence treatments (Post) were applied June 28, 1990. For the (Post) treatments, peas were in the 5 — 6 trifoliate leaf stage and wild radish ranged in size from the cotyledon to 6 leaf stage.

All treatments were made in 240 L/ha water and applied at 262 kPa pressure. The experimental design was a randomized complete block with four replications. Plots were 2 m x 5 m in size.

Weed control and crop tolerance were assessed July 25, 1990. Ratings were made visually and are reported on a scale of 0 to 100 percent; where 0 equals no weed control or crop injury and 100 equals complete control of weeds or death of crop.

RESULTS AND DISCUSSION: Wild radish was the only weed that escaped the trifluralin treatment in sufficient numbers to evaluate control. Excellent control of wild radish was obtained with treatments of dinoseb, clomazone, bentazon, tank-mixed with oil or preformulated with oil (Basagran Forte). Clomazone caused initial crop chlorosis; however, the crop recovered and grew extremely well. Dinoseb and treatments of bentazon were not injurious to the crop. Treatments with prometryne and MCPA/MCPB did not give good control of wild radish. MCPA sodium salt and MCPA amine gave good control of wild radish and the sodium salt formulation caused less crop injury than did MCPA/MCPB.

The treatments with metribuzin caused crop suppression and chlorosis. Injury was greater with preemergence applications. This trend was noticed elsewhere in other trials, with results varying with pea cultivars and soil types.

CONCLUSION: Applications of dinoseb continue to give some of the best weed control and crop safety results in peas. It appears that the favorable qualities of this herbicide will be difficult to replace with another product.

The results of tests with metribuzin would indicate that the crop is too sensitive to injury to consider registering this product for use on peas.

Though bentazon treatments do not have as broad a spectrum of weed species controlled, the crop safety would appear to be similar to the use of dinoseb.

From the results of this trial, the performance of two herbicides, MCPA sodium salt and clomazone, would indicate that they were worthy of further evaluation in the pea crop.

ACKNOWLEDGEMENTS: We wish to thank the Cobi Foods fieldmen of Berwick, Kings County for the use of their pea crop and their co-operation in not spraying over our trial area.

Table 1: Herbicide treatments used in the study, crop response and weed control ratings.

Treatment*	Rate/ha kg active	Method	Application Date	Crop Injury	Control of wild radish
clomazone	0.75	Pre. I**	06 07	slight chlorosis***	100
clomazone	0.75	Pre.	06 07	slight chlorosis***	100
prometryne	2.2	Pre.	06 07	0	75
dinoseb ester	3.36	Pre.	06 07	0	100
metribuzin ****	0.42	Pre.	06 07	5, sl chlorosis & supp.	90
metribuzin	0.56	Pre.	06 07	4, sl chlorosis & supp.	98
bentazon & assist	1.08 + 2.0 L	Post	06 28	0	99
Basagran Forte	1.08	Post	06 28	0	98
metribuzin	0.21	Post	06 28	3	98
metribuzin	0.28	Post	06 28	3, sl chlorosis	99
MCPA sodium salt	0.375	Post	06 28	1	93
MCPA amine	0.25	Post	06 28	2	96
MCPA/MCPB	1.1	Post	06 28	1	58
MCPA/MCPB	1.7	Post	06 28	3	70
Weedy Control	-	-	-	0	0

* Trifluralin was applied PPI by growen at 0.85 kg active/ha.

** (Pre. I) preemergence incorporation done shallowly with a garden rake.

*** Treatments with clomazone were observed to have extreme chlorosis three weeks after application. The crop was capable of outgrowing practically all of this injury.

**** Treatments with metribuzin in this trial were made with Sencor 75 DF formulation.

EVALUATION OF FUNGICIDES FOR CONTROL OF POWDERY MILDEW IN STRAWBERRY NURSERY STOCK, 1990

R.W. Delbridge, Plant Pathologist
John Arnold, Technician

MATERIALS AND METHODS: The fungicides used were Bayleton 50WP (triadimefon), Benlate 50WP (benomyl), and Kumulus S 80WDG (sulphur). Field plots consisted of a single row, 4 meters long, arranged in a Latin Square. Treatments were applied with a hand held pressurized C02 sprayer using 1400 L water/ha at 221 kPa. The spray schedule for all treatments except Bayleton (21) was based on a 10-14 day schedule beginning July 5 and repeated on July 17, 27, Aug. 4, Aug. 18, Aug. 29 and Sept. 11. Bayleton (21) was applied on a 21 day schedule beginning on July 5 and repeated on July 27, Aug. 18, 29 and Sept. 11. Leaf assessments consisting of 25 leaves per plot were made on September 11 using a 1-12 scale based on the ADAS Strawberry Mildew Key NO. 8.1.1 published by the Ministry of Agriculture, Fisheries and Food, U.K.

RESULTS AND DISCUSSION: The results are summarized in the table below.

Treatments	Rate kg ai/ha	Powdery Mildew Ratings (1-12)1
Bayleton (21)	0.07	4.80 a*
Bayleton (10)	0.07	4.98 a
Benlate	0.05	5.03 a
Kumulus S	4.00	5.70 b
Water Check	—	6.59 c

1 - Powdery mildew ratings 1-12;
1 - healthy, 12 - leaf area totally brown and apparently dead
* - Values followed by the same letter
are not significantly different. (P=0.05, LSD)

CONCLUSION: The level of powdery mildew control was not satisfactory. Benlate and Bayleton were the best performers.

EVALUATION OF FUNGICIDES FOR CONTROL OF CARROT BLIGHT

R.W. Delbridge, Plant Pathologist
John Arnold, Technician

INTRODUCTION: Leaf blights of carrots caused by Cercospora and Alternaria require fungicide applications to prevent economic losses from occurring. This study was intiated in order to evaluate and compare Rovral to the fungicides presently recommended for control of carrot leaf blight.

MATERIALS AND METHODS: The fungicides evaluated were Bravo 500 (chlorothalonil), Manzate 200 80WP (mancozeb), Polyram 80DF (metiram) and Rovral 50WP (iprodione). Two carrot fields in Great Village were selected. Field plots consisted of a single row, 4 meters long, arranged in a Latin Square. Treated rows were buffered on either side by unsprayed rows. Treatments were applied with a hand held pressurized C02 sprayer using 3300 L water/ha at 221 KPa. The spray schedule was August 2, 13, 24, September 4, 14 and 24. Blight intensity was assessed according to the criteria of Horsfall and Barratt on Oct 3 and Oct 15. Twenty randomly selected petioles from the middle of the canopy were assessed for diseased leaf area in each plot. Ten petioles from each plot were rated for number of stem lesions. Samples of infected foliage were examined microscopically c.v. caropak.

RESULTS: The results are summarized in the table below.

		% Leaf Area Infected		# Lesions per Stem	
Treatment	Rate	Field 1	Field 2	Field 1	Field 2
Bravo	2.80 *l*/ha	3.1	2.3	9.3	8.4
Manzate 200	2.25 kg/ha	2.0	2.9	17.0	9.3
Polyram	2.25 kg/ha	2.4	4.1	16.9	11.7
Rovral	2.00 kg/ha	9.5	7.7	25.9	21.9
Rovral	1.00 kg/ha	10.4	9.4	25.4	20.3
Rovral	0.50 kg/ha	9.3	8.4	28.3	21.1
Control		18.6	21.4	37.1	29.1

CONCLUSION: Bravo, Manzate 200 and Polyram effectively controlled carrot blight. Rovral did not provide adequate control. Microscopic observations showed that Rovral provided excellent control of Alternaria dauci but not Cercospora carotae.

LOWBUSH BLUEBERRY INSECT SURVEY 1990

Lorne Crozier, Entomologist

Abstract

A sweepnet survey was conducted on a weekly basis to monitor lowbush blueberry insects. A total of 42 growers participated and 297 fields were sampled. Twenty-seven fields had populations of insects which warranted control measures. A leaftier survey in 18 fields showed only three fields needed control measures. This program has been very useful in helping blueberry growers determine if pesticides need to be applied to their fields.

INTRODUCTION: The blueberry insect survey is an annual program conducted in cooperation with lowbush blueberry growers to monitor leaf feeding insect populations in blueberry fields. The results of the survey are tabulated weekly and used to alert growers to possible insect outbreaks and prevent damage to blueberry crops.

This year's sweepnet survey had participation from 42 growers and covered a total of 297 fields. This represents an increase in participation and coverage from 1989 when 33 growers and 241 fields were included in the survey. A survey for blueberry leaftier was also conducted.

MATERIALS AND METHODS: Participating growers were asked to take samples, using a standard 30 cm diameter sweepnet, from each of their fields. Three samples of 25 sweeps each were taken in each field. The samples are placed in one-litre plastic containers, which were supplied by the Plant Industry Branch. These samples were picked up once a week at designated pickup points by a student hired to sort and identify the insects in the samples.

Results of the survey are mailed to the grower on a weekly basis. If any potential problems are indicated by the results, the grower is contacted by phone as soon as possible.

The survey ran for ten weeks from May 14 to July 20.

The leaftier survey was conducted in 18 fields in the Diligent River area of Cumberland County. This area has had the only major infestation of leaftier. The blueberry leaftier cannot be sampled by sweepnet in its early stages as the caterpillars are either concealed in the fruitbuds of the blueberry or in the leaves which they tie together with silk.

Eighteen fields were sampled on three dates — April 27, May 4 and May 10. Three 100-bud samples were taken from each field on each sampling date. The buds were examined under a stereomicroscope for the presence of leaftier larvae.

A sweepnet survey of the same fields was conducted on May 24, 1991 to determine the rate of infestation of older larvae.

RESULTS AND DISCUSSION: The number of fields sampled each week was variable. Of the 297 fields that were sampled, 101 or 34% were sampled on a regular basis; 69 or 23% were sampled more or less regularly (3–4 times) and 127 or 43% were sampled only once or twice. The majority of this last group were fields that were sampled during July for case beetle. This group included a number of sprout fields. The distribution of fields by county is as follows: Antigonish — 9; Colchester — 70; Cumberland — 130; Halifax — 13; Hants — 9; Inverness — 4.

The total number of fields with insect populations which needed control measures was 27 or 9%, as compared with 42 or 17% in 1989.

Table 1: Results of the blueberry insect sweepnet survey.

	Number of Fields Requring Control Measures	
Insect	1989	1990
Blueberry Flea Beetle	4	2
Blueberry Leaf Beetle	3	8
Blueberry Case Beetle	29	7
Blueberry Spanworm	5	3
Blueberry Sawfly	1	7
Total	42	27
Total Fields Sampled	241	297

Table 2: Blueberry Leaftier Survey Results.

Sample Date	No. of Fields Sampled	<5% Infestation	>5% Infestation
April 27	18	18	0
May 2	18	16	2
May 4	18	15	3
May 24[1]	18	17	1[2]

1 – Sweepnet survey

2 – Some fields had received an insecticide treatment.

The data on each species of pest insect is listed in Table 1. Results of the leaftier survey are shown in Table 2.

One other field in the Fenwick area had moderate populations of leaftier. This is the first area outside of the Parrsboro region to have a leaftier problem.

In addition to the above, blueberry thrips were found in large numbers in four locations. This insect can only be controlled in the sprout year.

High numbers of a leaf beetle, Triachus atomus (Suffrian) were found in one field. It is not known if the general poor growth in the field was related to the presence of this insect. Triachus atomus has not been known to be a pest of blueberries. Little is known about its biology.

CONCLUSION: The number of growers participating in the sweepnet survey increased by over 25% and the total number of fields by over 30%. Overall, insect activity was less than in the previous growing season.

Adverse weather conditions in the early part of the season may have contributed to this fact, especially in the case of the blueberry leaftier.

Insect infestations requiring control measures were detected in 27 fields by the sweepnet survey. A further three fields needed control for blueberry leaftier. This program has been quite successful over the past few years in helping reduce loss from insect damage. Hopefully, this will continue in the future.

ACKNOWLEDGEMENTS: I would like to thank all of the growers who participated in the program. I would like to especially acknowledge Michelle Ralph for her diligent effort in collecting and sorting the numerous samples.

REPORT ON THE STRAWBERRY IPM PROGRAM 1990

Lorne Crozier, Entomologist
Rick Delbridge, Plant Pathologist

Abstract

A four-year project to introduce pest and disease monitoring to Nova Scotia strawberry growers was begun in 1990. Six growers from Colchester and Pictou counties participated.
Fields were sectioned into monitored and regular pest management treatments. A scout visited the fields twice weekly from mid-May until harvest. Strawberry weevil, tarnished plant bug, two-spotted spider mite and Botrytis levels were checked. The results were rather irregular. Several factors including haste of implementation, inexperience and poor field conditions lead to less than satisfactory results. All growers saw some value in the program and it hoped that future programs will be more successful.
Residue analysis was done on berries from two growers. No significant pesticide residues were found.

INTRODUCTION: A pest and disease monitoring program was implemented for the 1990 growing season.

This project was initiated and administered by the Strawberry Growers' Association of Nova Scotia.

The project leaders are Lorne Crozier, Entomologist and Rick Delbridge, Plant Pathologist, Nova Scotia Department of Agriculture and Marketing.

The purpose of the project is to develop and implement a pest monitoring system for Nova Scotia strawberry growers. It is hoped that this program will help growers improve their production system, reduce the amount of pesticide use and hence reduce production costs.

This project will be run over a period of four years starting 1990. The first two years of the project will be carried out on farms in Colchester and Pictou counties. In the third and fourth years the project may be extended to Kings County.

MATERIALS AND METHODS: Initially six growers volunteered to participate. Each grower provided one field of strawberries to be monitored by a scout for various pest and disease problems. Third year or older fruiting fields were selected on the basis that less risk was involved for the grower.

Each field was divided in half. One half was monitored for pests and control measures were applied according to the findings of the scout. The other half of each field was treated under the normal management practices of the grower.

The fields were monitored twice each week on a regular basis until harvesting was complete. Scouting report sheets were left with the grower on each occasion.

The program began mid-May, 1990. Each field was visited and staked out into its two halves.

Five plots, each three metres in length were staked out for monitoring strawberry weevil.

Ten plots, one metre in length, were staked out with five plots on each half of the field. These plots were for collecting yield data and fruit samples for pesticide residue analysis.

The insect species which were monitored were strawberry weevil and tarnished plant bug.

Strawberry weevil was monitored by counting the number of clipped blossoms in a three-metre plot. The threshold for control measures was 1.5 clipped buds per metre of row (Shaefers, G.A., 1981, Kovach et al. 1990).

Tarnished plant bug was monitored by tapping or shaking blossom clusters into a white plastic container. The number of tarnished plant bug nymphs was recorded. A total of thirty bud clusters were randomly sampled throughout each field.

The action threshold of 0.5 nymphs per cluster was used (Bostanian et al. 1990).

Two-spotted spider mites were also sampled for. Sixty leaves per field were examined for the presence or absence of mites. The action threshold was 25% of the leaves with an active mite stage present (Raworth et al. 1990). Mite samples were collected once per week.

A red stele survey was carried out in the first week of the program. The roots were checked randomly throughout the field. If red stele was detected the area was marked with stakes and an attempt was made to determine the size of the infected area.

Two sprays for fruit rot (Botrytis) were applied. One spray was applied at 10% bloom and a second spray was applied 10 days later (Kovach et al. 1990).

Yield data was collected from the five one-meter plots on each half of the field. At least three pickings were taken from each plot. The berries were weighed and sorted using the following classification: marketable berries, with berry rot, deformed and other. The last category included damaged berries and very small or unripe berries.

Samples of berries from two growers were analyzed for pesticide residues.

RESULTS: Strawberry Weevil: Damage from strawberry weevil was quite variable ranging from light to very severe (Table 1). All growers applied at least two sprays to control this insect.

The high numbers of weevil were to be expected since the plots were all in older plantings of berries.

Weather conditions were also a factor. There was a sudden change from very cool temperatures to several days of very warm. This resulted in weevils being present in large numbers on the very first sampling. In view of this, sampling should begin earlier in the season. In the future, older plantings with a past history of weevil damage should receive a spray application at the first sign of weevil activity and then use monitoring to determine the need for subsequent sprays.

The technique used for assessing damage was not very satisfactory. The time involved in taking each count was much too long. Also, the fact that the damaged buds from previous counts were recounted each time, lead to confusion in interpreting the meaning of the counts.

The counts did demonstrate the amount of damage that can be done by this insect. It also gave growers some idea of how well their control attempts were working.

Tarnished Plant Bug: Tarnished plant bug levels were very low throughout the season. The threshold for spray application was not reached in any of the test fields.

Two-Spotted Spider Mite: The results of this sampling were quite variable and somewhat dissatisfactory. Unfortunately the scout had difficulty in processing the samples in the time allotted. The counts were therefore not reported to the growers as intended. This situation will have to be rectified in the coming season.

Yield, Fruit Quality and Disease: Yield records were not recorded from one field due to a severe weed problem. The results from the other five were variable, ranging from a low of 2700.6 g. to a high of 7549.6 g per 5 1-meter plots (Table 2). There was very little difference in the insecticide or fungicide schedule used between the IPM and the conventional treatments. The yield difference between the IPM and conventional sections was due to field and plant variability, red stele, weed pressure, etc. Three pickings of fruit were harvested from ten plots. The levels of fruit rot and overripe fruit were higher than expected but this probably can be attributed to the limited number of pickings resulting in decay and overripening of the fruit.

Each field was checked for the presence of red stele. Four of the five fields had red stele. Leaf spot was a problem in one field and a fungicide application was recommended for control. Powdery mildew was present but was not considered economically important in any of the six test fields.

Pesticide Analysis: Berry samples from two growers selected at random were submitted for residue analysis. There was no significant difference between the IPM and standard sections. All residues were well below the maximum residue limit set under Canadian Food and Drug Regulations.

DISCUSSION AND CONCLUSIONS: At best the first year of the strawberry pest monitoring program can be described as a learning experience. There were a lot of mistakes made, partially due to haste in implementation of the project and partially due to inexperience. There is a need for better communication among all parties concerned. The lack of communication resulted in misunderstandings as to when sprays should be applied or whether the information was received in time to take appropriate action.

The assumption that a first-year student could be trained in a short period to do an adequate job was erroneous. The level of expertise anticipated by both the project leaders and growers is far beyond the capabilities of a first-year student.

The selection of older bearing fields also contributed problems such as extremely high pest populations, weed problems and disease problems.

On the positive side,we feel the program did increase the growers' awareness of pest problems and in some cases, indicated that pesticide applications had not effectively controlled the problem. The fact that all of the growers are willing to participate in the program for another season is also encouraging. We are sure that by learning from our first year's experience that future results will be much more encouraging.

Additions to the program are being considered for the 1991 season. These include:

1. Soil and leaf tissue testing.
2. Fertilizer recommendations
3. Weed survey of fields involving Doug Doohan - spring, renovation and fall.
4. Operation spray-check for participating growers' sprayers.

ACKNOWLEDGEMENTS: This project is funded under the Technology Introduction and Evaluation Program of the Canada/Nova Scotia Agri-Food Development Agreement. We would like to thank the growers for their participation in the project and Rodger Lawrence for his efforts as scout. We would also like to acknowledge the Nova Scotia Pesticide Laboratory for analyzing samples. Finally, we would like to thank Bela Casson for administrating the financial aspects of the project.

REFERENCES:

Bostanian, N.J. and G. Mailloux, 1990. Threshold levels and sequential sampling plans for tarnished plant bug in strawberries, in Monitoring and Integrated Management of Arthropod Pests of Small Fruit Crops, N. J. Bostanian, L.T. Wilson, T.J. Dennehy, editors, Intercept Ltd. Andover 1990, pp. 81–101.

Kovach, J., W. Wilcox, A. Agnello, M. Pritts, 1990, Strawberry Scouting procedures, a guide to sampling for common pests in New York state, Cornell Cooperative Extension Program, General No. 203, 23 pp.

Raworth, D.A. and W.B. Strong, 1990, Development of a management protocol for the two-spotted spider mite Tetranychus urticae Koch (Acari: Tetranychidae) on strawberries, in Monitoring and Integrated Management of Arthropod Pests of Small Fruit Crops, N.J. Bostanian, L.T. Wilson, T.J. Dennehy, editors, Interccept Ltd., Andover 1990, pp. 103–116.

Schaefers, G.A. 1981, Pest Management Systems for Strawberry Inscts in Handbook of Pest Management in Agriculture, Vol. III, D. Pimentel, editor, pp. 377–393, CRC Press, Boca Raton, Fla.

Table 1: Strawberry Weevil Counts, Average Number of Clipped Buds Per Meter[1]

Sample Sequence	1	2	3	4	5	6	7	8
Field # 1	-	1.8	10.7	18.4	46.9	43.0	43.0	90.0
Field # 2	1.2	2.3	4.5	5.3	-	8.8	11.9	14.5
Field # 3	0.8	4.6	9.3	21.1	37.9	47.3	38.9	40.9
Field # 4	10.5	19.0	22.3	34.5	44.0	59.3	60.3	65.9
Field # 5	0.0	0.5	2.1	3.7	3.1	5.7	3.5	2.2
Field # 6	0.0	3.9	5.6	6.5	3.7	8.4	10.4	11.3

[1] Figures are the average for the five 3-meter plots. Each number represents the total number of clipped buds including those from the previous sample date.

Table 2: Yield and Quality Data

Field No.	Yield(gm)	% Marketable	Marketable Wt.(gm)	% Fruit Rot & Overripe	% Deformed	% Other Damage
1 IPM	3574.6	54.7	1955.3	35.8	5.9	3.6
Reg.	2700.6	65.6	1771.6	22.3	5.9	6.2
2 IPM	6687.9	61.2	4093.0	14.0	18.4	6.4
Reg.	7038.5	59.9	4216.1	18.1	19.1	2.9
3 IPM	7549.6	73.4	5541.4	9.2	14.9	2.5
Reg.	4709.4	74.9	3527.3	12.2	9.7	3.2
4 IPM	6938.1	68.0	4717.9	11.0	10.0	11.0
Reg.	6686.6	79.1	5289.1	10.4	7.8	2.7
5 IPM	5949.2	65.6	3902.7	24.6	6.8	3.0
Reg.	4962.9	78.2	3881.0	12.4	5.7	3.7

COMPUTER PROGRAM FOR MORE EFFICIENT DEVELOPMENT AND EFFECTIVE PRESENTATION OF ORCHARD MANAGEMENT PLANS
PRELIMINARY REPORT

Dick Rogers, Apiculturist/Tree Fruit Entomologist

INTRODUCTION: Tree Fruit extension and research staff traditionally meet with interested growers on an annual basis each winter/spring. The past season's management programs and pest problems are reviewed at this time and a tentative pest control program for the upcoming season is developed. This latter process involves deciphering the often nonquantitative information provided by growers and then manually writing down a list of tactics that may be warranted during the next growing season. Timing, materials, rates, targets (i.e. insects, mites, disease, fertility, weeds), and locations would all be identified as accurately as possible. When a grower requests that several orchard blocks and/or more than one crop type be discussed it becomes quite a challenge to prepare concise, block specific, and easily interpreted recommendations using a manual format. After hand writing a draft report, it would be passed to the secretarial staff to interpret, type and return for review, revised if necessary and finally mailed. Therefore, a computer program was developed to assist with organizing and presenting the orchard management recommendations.

MATERIALS AND METHODS: The program was developed on an Apple Macintosh SE/30 (1mb RAM, 40mb internal harddrive, Motorola 68030 microchip), using database software called Filemaker II.

Program development involved a) designing a data entry screen, and b) writing reports that would automatically select, manipulate, and format data. Goals for program function were to a) eliminate the need to repetitively write and type chemical names and rates; i.e. the program should interpret coded input and automatically insert the appropriate information, and b) be able to hand each grower a finished, printed report by the end of each consultation.

RESULTS AND DISCUSSION: The thought process leading to the development of the program began in March, 1990 and an untested version was ready by December, 1990. During the development phase it was realized that the former consultation report title of "Tentative Spray Program" did not encompass the full thrust of the whole exercise, and the connotation of the phrase was somewhat misleading. Therefore, the name of the report was changed to "Tentative Orchard Management Plan" so it could justifiably incorporate IPM concepts and other orchard management tasks. The consultation program has been named CHOMP because it is meant to take a bite out of the workload of specialists, secretarial staff, and growers, and because CHOMP is an acronym for "Champion of Orchard Management Plans".

The final hardcopy of the report includes a title page, a summary of Tree Row Volume calculations based on block measurements supplied during the consultation, and chronologically ordered listings of orchard management tasks for each specific block.

CONCLUSION: After processing test orchard data, it appears that the program will work properly and accomplish its intended purpose. The block specific reports, detailed information, and organized format should help growers become better orchard managers and thus better able to implement IPM.

ADVANTAGES AND DISADVANTAGES OF USING PYRETHROIDS IN NOVA SCOTIA APPLE ORCHARDS

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and C.R. MacLellan, Entomologist (Retired)

Abstract

A commercial pest management company recorded data on use of insecticides and miticides, insect and mite densities, and insect and mite injury to fruit and foliage in 132–175 orchard blocks from 1980 to 1983. The pyrethroids permethrin and fenvalerate were used mostly before bloom for control of the winter moth (WM), Operophtera brumata (L.). Fenvalerate was used, mostly after bloom, to control the spotted tentiform leafminer (TLM), Phyllonorycter blancardella (F.). In 1980, blocks in which a pyrethroid was used had lower levels of WM injury to fruit and fewer fruit stings caused by mirids (mostly Atractotomus mali (Meyer) and Campylomma verbasci (Meyer)), than did the blocks with no pyrethroid treatment (nonpyrethroid blocks). Prebloom applications of pyrethroids led to lower numbers of first and second-generation TLM mines per leaf, whereas applications after bloom led to reduced counts of second-generation mines. In 1980 and 1983, the percentage of fruit injured by insects was lower in pyrethroid-treated blocks than in nonpyrethroid blocks. In 1981, densities of insects were less frequently above their economic thresholds and fewer insecticide applications were needed in orchard blocks that had a single prebloom fenvalerate treatment or prebloom plus postbloom pyrethroid treatments than in blocks with no pyrethroids the previous year. However, disadvantages were associated with pyrethroid use. Higher counts of first and second-generation TLM mines sometimes were associated with fenvalerate or multiple pyrethroid use the previous year. Single applications of fenvalerate, multiple pyrethroid applications in one year, or applications in two successive years were associated with higher counts of the European red mite, Panonychus ulmi (Koch), and the apple rust mite Aculus schlechtendali (Nalepa), higher levels of leaf bronzing by mites, and more frequent use of miticides. Fenvalerate was implicated more frequently than permethrin. The greater influence of fenvalerate was attributed to its greater toxicity to the predatory mite, Typhlodromus pyri Scheuten, and to its longer residual activity.

PESTICIDE USE AND LEVELS OF INSECT AND SCAB INJURY ON FRUIT IN NOVA SCOTIA APPLE ORCHARDS

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Abstract

A commercial pest management company recorded pesticide use and levels of insect and scab injury to apples from 1980 to 1983. Mean numbers of insecticide and miticide applications were 2.5 and 0.5 per year, respectively. Mean costs of insecticides and miticides (material only) were $44.44 and $23.50/ha. These totals varied little from year to year despite large variations in costs of controlling individual pests. Scouting costs rose from $25.00/ha in 1980 to $37.50/ha in 1983. Targets of most insecticide applications were winter moth, Operophtera brumata (L.); codling moth, Cydia pomonella (L); and apple maggot, Rhagoletis pomonella (Walsh). European red mite, Panonychus ulmi (Koch), was the target of most miticide applications. Despite low frequencies and low total costs of insecticide applications, total insect injury averaged only 2.3% of the fruit, declining from 3.8% in 1980 to 2.0% in 1983. Scab injury averaged 1.9%, varying from 0.9% in 1981 to 3.7% in 1983. Success of the integrated pest management (IPM) program is attributed to pest monitoring and use of economic thresholds as well as to a range of tactics designed to minimise impact of pesticides on natural enemies and to delay onset of resistance among the pests.

EFFECT OF PESTICIDE APPLICATIONS ON ABUNDANCE OF EUROPEAN RED MITE (ACARI: TETRANYCHIDAE) AND TYPHLODROMUS PYRI (ACARI: PHYTOSEIIDAE) IN NOVA SCOTIAN APPLE ORCHARDS

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Abstract

Pesticide use and mite counts were recorded in 38 apple orchards in 1985 and 46 orchards in 1986. Pesticides were scored on a scale from 1 (harmless) to 4 (harmful) according to their toxicity to the phytoseiid mite Typhlodromus pyri Scheuten. Counts of European red mite, Panonychus ulmi (Koch), were higher in orchards with higher total insecticide scores and more applications of certain insecticides (azinphosmethyl, cypermethrin, deltamethrin, dimethoate, and pirimicarb) and fungicides (benomyl and captan). T. pyri were found in 26% of the orchards surveyed in 1985 and 35% of those surveyed in 1986. Orchards with T. pyri had higher counts of apple rust mite, Aculus schlechtendali (Nalepa), and were more likely to have had applications of the less toxic insecticides, pirimicarb and azinphosmethyl, than were the other orchards. Orchards with T. pyri also had lower seasonal scores for fungicide toxicity and fewer applications of the acaricidal fungicide, Dikar (a mixture of mancozeb and karathane), or the insecticide phosalone. In orchards with T. pyri, higher counts of the phytoseiid were associated with higher counts of apple rust mite, twospotted spider mite, Tetranychus urticae (Koch) and the predacious stigmaeid mite, Zetzellia mali (Ewing) as well as with applications of pirimicarb, dichlone, and metiram. Counts of T. pyri were reduced by higher total toxicity scores for fungicides and miticides. We conclude that prospects for biological control of European red mite are good if organophosphate-resistant T. pyri are released in uncolonized orchards and if growers used a modified spray program to promote survival of T. pyri and apple rust mite. The program should include use of dichlone and captan to control apple scab, Venturia inaequalis (Cke.) Wint., pirimicarb, azinphosmethyl, or phosmet to control insects after bloom, and bacterial/pyrethroid mixtures rather than recommended rates of pyrethroids to control winter moth , Operophtera brumata (L.), and leafrollers.

FIELD CROPS SECTION PROJECT REPORT TITLES

The following field crop projects were conducted by the Plant Industry Branch in 1990. The full reports are included in the Field Crops Project Results 1990 publication.

FORAGES

- **Perennial Ryegrass Regional Variety Evaluation Trial**
- **Perennial Ryegrass Screening Trial**
- **Verticillium Wilt Resistant Alfalfa Cultivar Adaptability Trial**
- **New and Improved Perennial Pasture Mix Demo, (ALFI Project # TT 109)**
- **Determining Dates of Harvest for Alfalfa-Brome Forage**
- **Forage Establishment Demonstration**
- **Forage Establishment Trial**
- **Pasture Mixture Study**
- **Sonja White Clover Demonstration**
- **Mira Pasture Grazing Project**
- **Cumberland County Pasture Mix Demonstration**
- **Pasture Mix Preference and Performance Demonstration**
- **Demonstration of Various Perennial Pasture Mixtures**
- **Integrated Pasture Management for Improved Weed Control, (ALFI Project # TT 93)**
- **Control of Softrush in Pasture**

CEREAL

- **Production Management Trials**
- **Winter Wheat Production Management**
- **Spring Wheat Production Management**
- **Barley Production Management Trials**
- **Oat Variety Trial**
- **On Farm Winter Wheat Variety Trial**
- **Spring Cereal Seed Rate and Row Spacing**

- **Foliar Fungicides on Spring Wheat and Barley**
- **Septoria Control in Cereals**
- **Fusarium Control on Cereals**
- **Management Comparison of Max and Katepwa Spring Wheat**
- **Cereal Seed Treatment Evaluation**
- **Barley Tolerance to Herbicides at Three Growth Stages, (ALFI Project # TT 93)**
- **Spring Wheat Tolerance to Herbicides at Three Growth Stages, (ALFI Project # TT 93)**
- **Fall Herbicide Treatments for Scentless Chamomile Control, (ALFI Project # TT 93)**

CORN

- **The Evaluation of Early and Advanced Line Selections from the Low Heat Unit Grain Corn Breeding Program**
- **Corn Variety — Annual Clover Trial 1990**
- **Corn Silage — Hybrid Evaluation**
- **Pioneer High Moisture Ear Corn — Hybrid Evaluation**
- **Control of Smooth Crabgrass and Triazine Resistant Lambsquarters in Corn**

OTHER

- **Field Crops Expo '90: A Transfer of Cropping Information to the Industry (ALFI)**
- **Cropping Report of the Tile Drainage Spacing Project, (ALFI Project # TD 12)**
- **Evaluation of a Windrow Inverter to Improve Wilting Speed and Forage Quality (ALFI)**
- **Lely Mechanical Weeder, (ALFI Project # TT 135)**
- **Soybean On Farm Variety Comparison**